THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXII. No. 1587.] LONDON, OCTOBER 10, 1893. [45TH YEAR. PRICE 6d.

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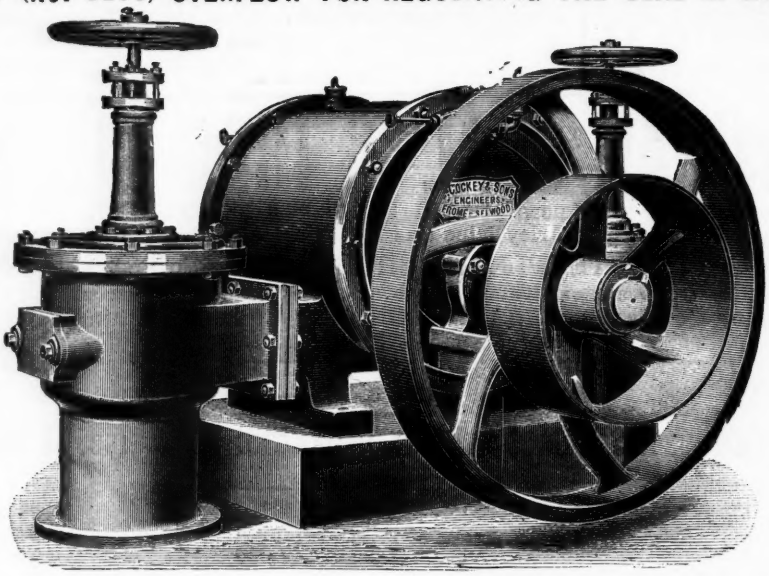

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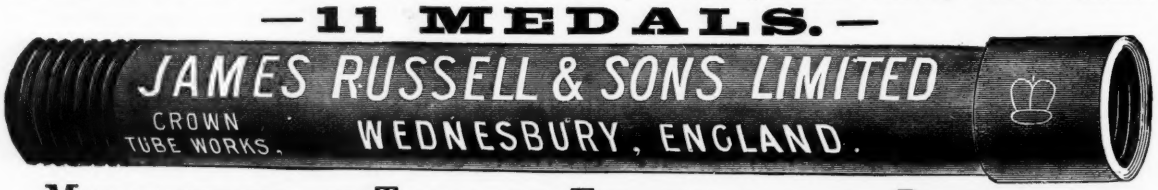

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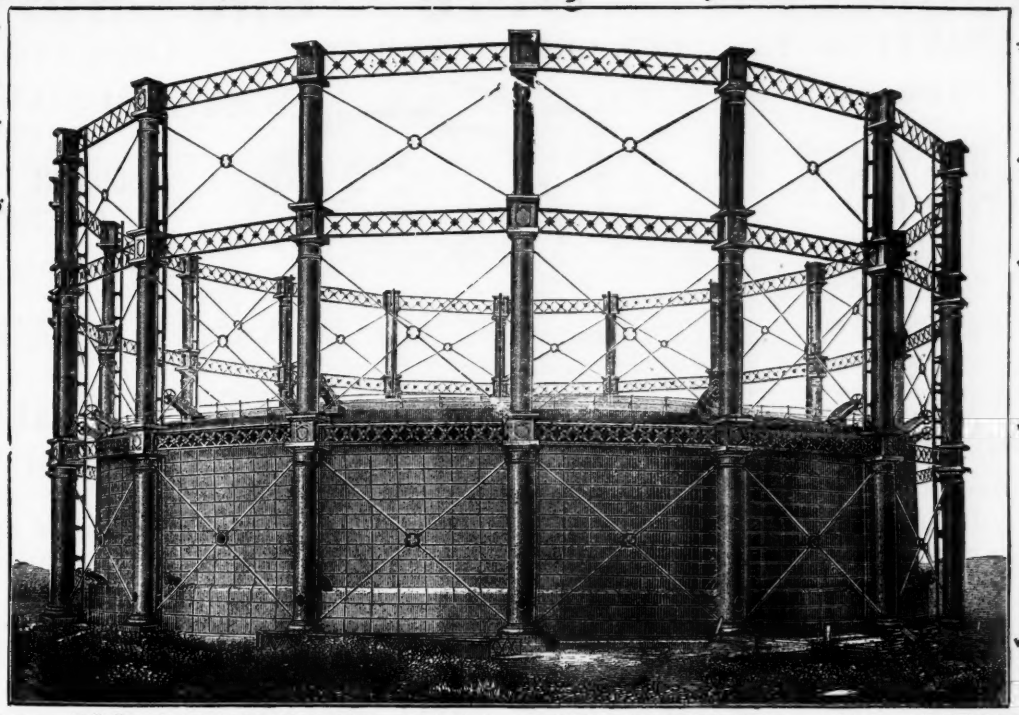

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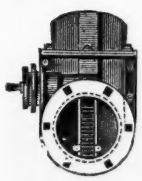

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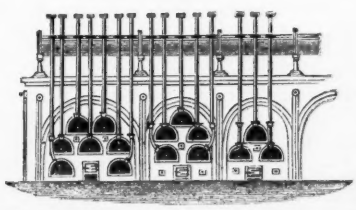

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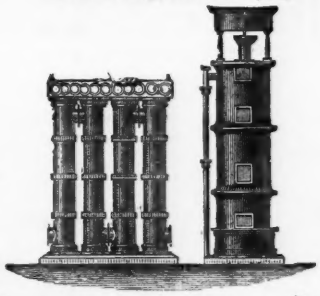

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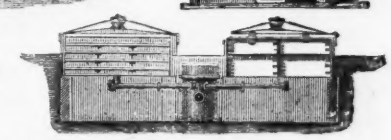

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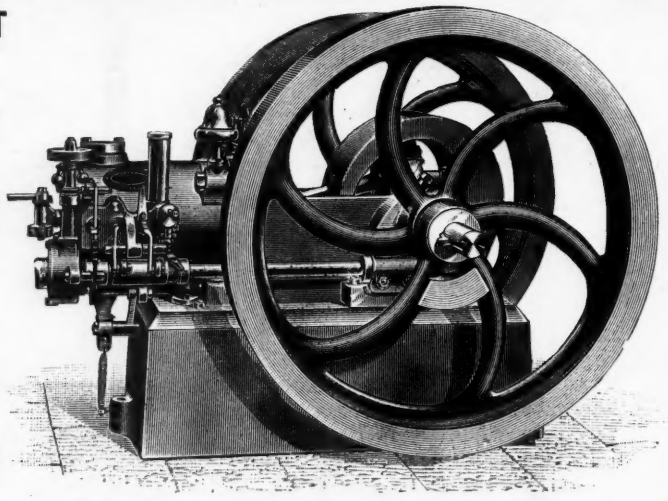

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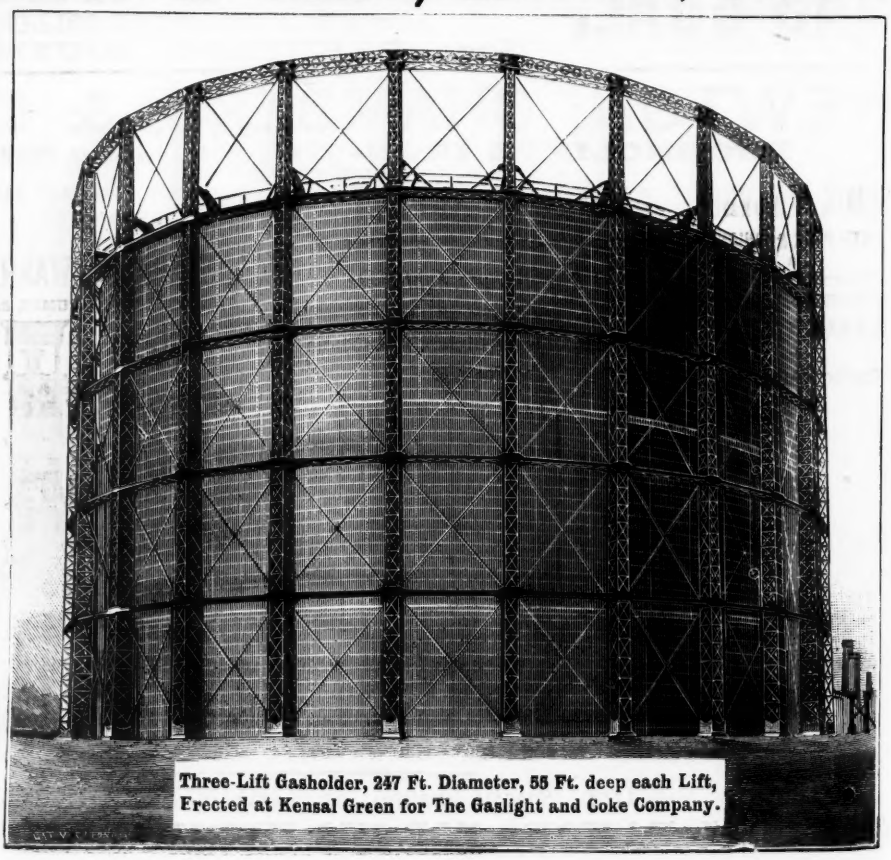

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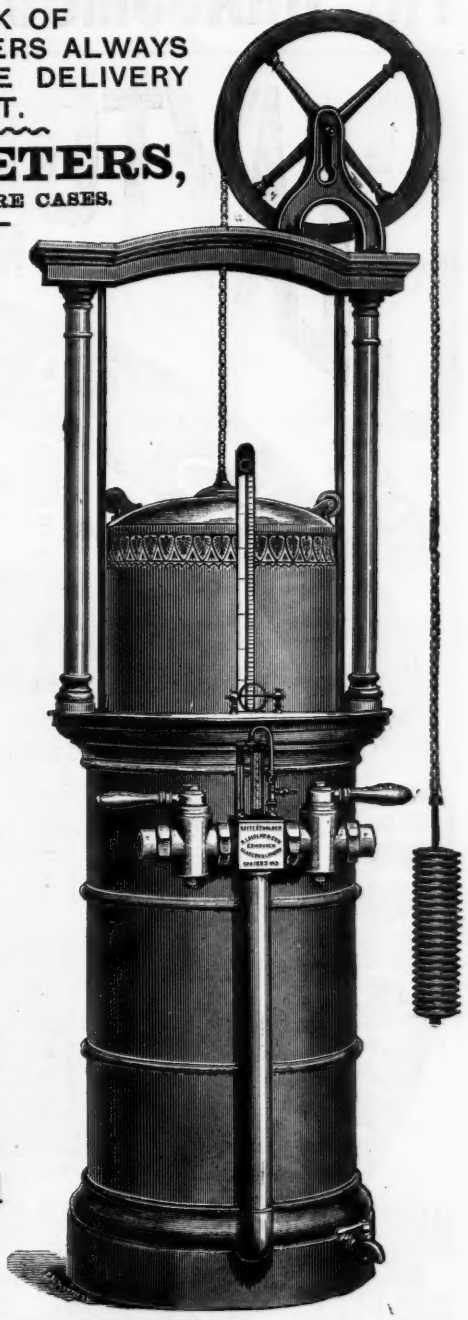

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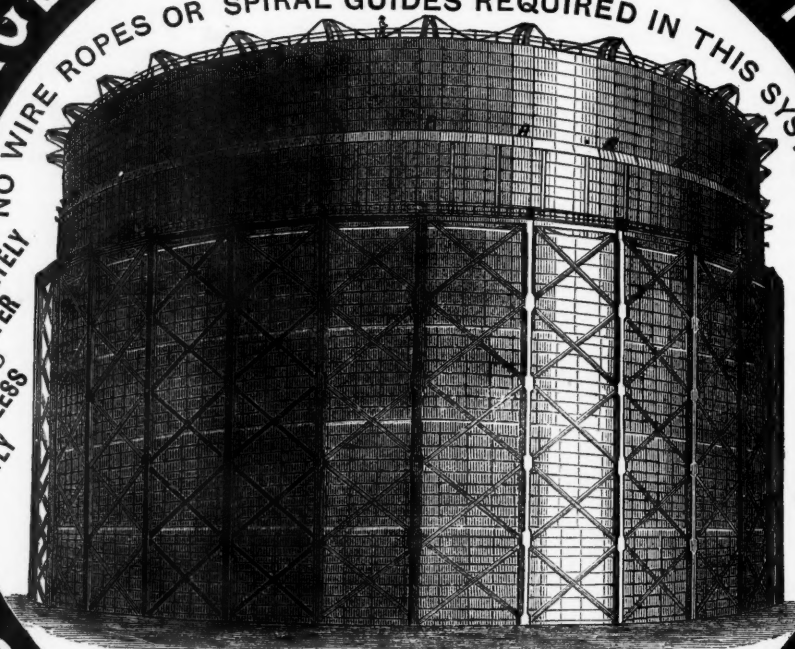

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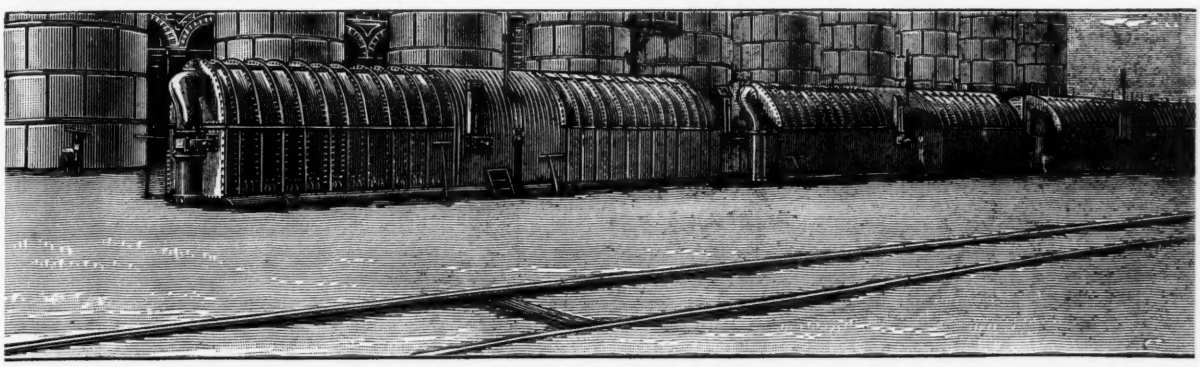

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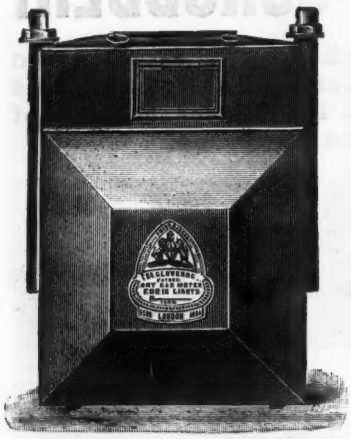

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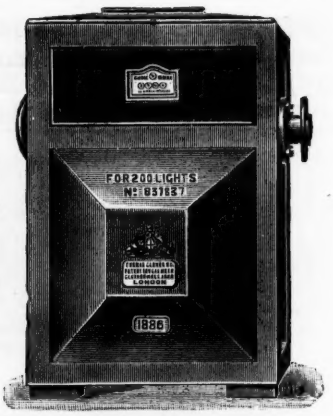

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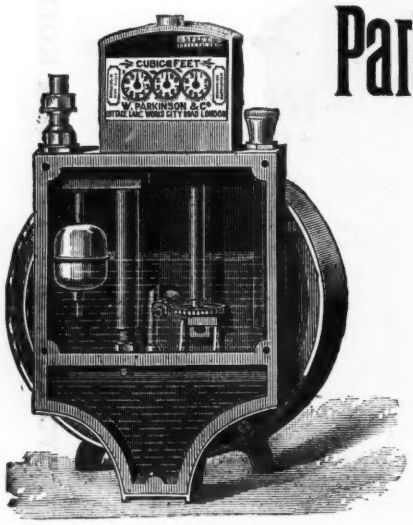

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JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, OCTOBER 10, 1893.

The Condition of the Coal Strike.

THE course of the great coal miners' strike was marked last week by two incidents. One was the resumption of work at many pits where the men were called out by the Federation leaders, though no notice of reduction of pay had been given; and the other was the conclusion of arrangements for a meeting, to be held yesterday, of representatives of the coalowners and the strikers, together with the "six Mayors" who have bound themselves to the honourable task of finding a way to stop the dispute between masters and men. With regard to the partial resumption of work referred to, it is only worth mentioning as an admission of their error on the part of the Federation leaders, although this is naturally denied by their admirers. The number of pits affected in this movement is too small to influence the main issue, or to relieve the strain upon the coal markets of the big towns; and coal is everywhere growing dearer instead of becoming cheaper. The success of the associated Mayors in prevailing upon the Executive of the Miners' Federation to meet them and the representative coalowners, in order to discuss the situation, is probably a small matter, inasmuch as both parties profess their intention of abiding by their declared policies. Nevertheless, certain proposals aiming at a termination of the strike will be laid before the meeting; and this is something to the good. We join heartily with the *Daily News* in the statement that "the six "Mayors, representing great communities whose industries "are paralyzed by the strike, represent the interest of "the public before the contending parties. They will "plead with great force for peace. They will have the "good wishes of the whole kingdom with them in their "effort—not yet, perhaps, to mediate, but to establish a "basis on which mediation may proceed." At a miners' demonstration held in Sheffield, a speaker, referring to the proposed conference, expressed his regret that the railway and gas companies were not to be represented.

The last remark has evidently inspired the *Daily News* with the first tangible suggestion offered by the newspaper press for solving the coal trade problem without actually allowing the views of either side in the controversy to prevail. This is that the contractors for large coal supplies, the terms of which are the dominating factors in determining the conditions of the coal trade from time to time, should consent to such a modification of the contract prices as will enable the coalowners to continue paying the men the rate of wages hitherto prevalent. And this proposal is favoured by the *Daily News*, which only the other day stood upon the stilts of high-and-dry political economy in regard to the projected Coal Trust, which it declared to be "unacceptable," and professed a preference for the "higgling of the market" to any arrangement for keeping up coal prices to a paying mean. Where is political economy and the higgling of the market now? Is a bewildered public to understand that it is right and proper to revise contract prices, agreed upon in open market, upon the recommendation of "six Mayors," and wrong to take precautions in advance against that commercial underselling which the colliers allege to be at the bottom of the existing troubles?

So far as gas undertakings are concerned, we are prepared to say, whatever may be in the united mind of the six Mayors, that their administrators are no more disposed to insist upon having their "pound of flesh" than any other party to a contract. We are now told that if the revision of gas coal contracts in the sense of adding from 6d. to 9d. per ton to the covenanted prices should be the main suggestion of the six Mayors, "it will impose a very "serious responsibility on the holders of these contracts." There is no fear, we are assured by the *Daily News*, in the zeal of its newly-found Opportunism, as to the municipal corporations. "There is not a town councillor in England "who would dare to show himself to the constituencies "on the first of November, if he raised any objection to "a proposal to modify the contract for coal supplied to "the municipal gas-works. The sympathy everywhere "felt for the wives and families of the workpeople would "make any such proposal popular if it offered an opening "for a just and satisfactory settlement of the dispute." This is all very well; but where again is the vaunted "higgling of the market"? If it is to be understood that the coal trade ought to be put into leading-strings, so be it. We might then discuss what sort of leading-strings are likely to prove most satisfactory. We look in vain, however, for any indication in our esteemed daily contemporary of a sense of the gravity of the suggestion that contracts should be modified in a particular sense because the proceeding might be supposed to be "popular." Is this, then, to be the measure of all the transactions of civilized life? Is there to be no law, no justice, no morality that cannot be classified by that modern oracle, the newspaper writer, as "popular"? In the particular case of gas coal contracts, is the purchaser to tell the seller that such and such a tender is obviously too low, that he

cannot pay a living wage under such conditions, and, in brief, that he does not understand his business? Let us know where we are in this matter.

In regard to the question of revising the price of coal duly contracted for, if this could be discussed as a detail of the business of gas supply, apart from the principle, it could easily be admitted that neither gas companies nor municipalities care greatly whether they pay 6d. or 9d. a ton more or less for their raw material. This consideration affects the gas consumer mainly; and but few undertakings sail so close to the wind that an alteration of the price of coal by a few pence makes any material difference to them. They pay more or less, according to the state of the market. It is so utterly strange a suggestion that they should go behind the market, and assume any responsibility for what becomes of the money they pay for their coal, that we protest against the implied accusation of the *Daily News* that if gas manufacturers do not see their way instantly to throw up their contracts they will incur the reproach of Shylock. And if they do, what does it mean? Simply that the coalowners are right, and that it is prices, after all, and not wages, which control the trade. The colliery proprietors might say: "We were "not able, by the 'higgling of the market,' to get as high "a price as we wanted for our coal, which would have "enabled us to pay certain rates of wages to our workmen. "It does not matter to us how the improved price has "been obtained—whether by the intervention of half-a-"dozen Mayors or in another way. The fact is sufficient; "and now we will gladly pay the old rates of wages." Does anybody believe that this would be a means of permanently settling the coal trade upon a paying basis? Imperfect as Sir George Elliot's plan of consolidation may be—and it doubtless needs considerable improvement—it is less unreasonable and less dangerous than this astounding proposal of leaving the trade to the "higgling of the "market," *plus* philanthropic correction by six Mayors.

The last thing we heard respecting this subject before going to press was that the Government contemplates offering assistance to bring about a conciliation between the miners and coalowners; and that, if acceptable to both sides, two prominent statesmen will represent the Government at a conference to be arranged. If this rumour has any other basis than the personal offer of Mr. Mundella and Mr. Fowler to do anything in their power to bring the parties to the dispute together, it may well be thought, as *The Times* puts it, that Ministerial or even Parliamentary interference in an industrial controversy can hardly fail to do mischief. At any rate, it would appear for the present that the municipal dignitaries who were to take part in yesterday's meeting are just as likely to exert a good influence as any statesmen, who are, after all, politicians also. And if the revision of coal contracts is actually proposed as supplying the key to the existing deadlock, it is difficult to see how responsible Ministers of the Crown can have anything to do with so revolutionary a proposal.

The Portsmouth Meeting and other Matters Concerning the Institution of Gas Engineers.

THE Autumn Meeting of the Institution of Gas Engineers at Portsmouth on Tuesday and Wednesday last was very enjoyable for those who took part in it. The arrangements made by the Committee and the Secretary (Mr. Thomas Cole) were well considered; and the programme was carried out with a completeness and regard for punctuality that enabled every member to make his private convenience accord well with his loyalty to the Institution. This is a most essential element of the considerations that go to make gatherings of the kind successful. It is not possible for all gas managers, with the multitudinous demands upon their time that are incidental to their calling, to stay out even a two days' meeting, especially at this season of the year. But if it is known where the party will be, and how they will be engaged, at a particular hour, it is made easier for those who can only put in an appearance for a portion of the time appropriated to the purposes of the meeting; and this is better than non-attendance. It is to be regretted that the deplorable coincidence of the great coal miners' strike should have occurred to keep so many members away from the South of England at this juncture. This is a catastrophe that it may be devoutly hoped will not recur next October; and we believe it would be a mistake for the Executive of the Institution to jump to the conclusion that the small attendance at Portsmouth is sufficient justification for abandoning an experiment which was so much more successful in this respect last year. At the same time, it is impossible not to sympathize with those gas engineers and managers—neither few in number nor personally insignificant—who see, not merely in one particular meeting, depressing indications that the regrettable division in the ranks of the members of the gas engineering profession of this country is a source of weakness all round.

After all is said that can be said either in explanation or in defence of the existing state of things, the facts remain discreditable to the public spirit, the common sense, the worldly wisdom, and the neighbourly feeling of those who are either responsible for, or consent to, their perpetuation. We would not be misunderstood in regard to this delicate question, as seeking to throw blame in particular upon any man, and certainly not as desiring to rake together the dying ashes of old controversies for the purpose of reviewing opinions expressed and actions performed in good faith and with the best intentions at the time. "Hindsight," as the humorous philosopher observed, "is always better than foresight;" and to talk of what might have been if things had occurred differently, or had different issues, is as idle an amusement in connection with the affairs of the men belonging to the gas industry as were Gibbon's speculations as to how the course of civilization might have been altered if the Turks had never been beaten under the walls of Vienna. The point is, whether the epoch has yet arrived for composing the individual and other differences that have split the personality of the British gas industry into two unequal sections, which are manifestly also unequal to their self-imposed *rôle* of having nothing in common. There is not a man in either party who will confess to being absolutely irreconcileable with those of the other side who have ranged themselves under a different banner; but it is undeniable that, so long as the division continues, little sores and slights are only too likely to arise and keep long-standing animosities alive. Meanwhile, there is nothing more dignified about the mutual sulking in the two gas managers' camps than there is in the rivalry of a couple of provincial gossiping "sets." There used to be much muttering about the "clique" of the management of the old British Association of Gas Managers; but the most prominent result of fission in the case in point is that there are two managing "cliques" instead of one. It is only fair to admit that other results have been obtained. There always was, in the composition of the old British Association, an undesirable element which was aggravated in The Gas Institute. From this objectionable component the Institution is free; but so are other more localized organizations. The Institution has gathered unto itself a few supporters who kept aloof from the older body mainly on account of this organic defect; but, to all intents and purposes, the membership of the two organizations is drawn from the same sources, and the acknowledged aims of both are identical. Is it too much to hope that some day a great amnesty will be proclaimed (to copy the celebrated phrase of Mr. John Morley), and that gas managers will be so magnanimous as to shake hands over the past, and emulate each other only in respect of what is good? Let us put it in this way: The Gas Institute inherited from its predecessor a kind of "bean-feast" tradition which the finer taste of the present day has rendered obsolete. Cannot this tradition be dropped, with all those who have identified themselves with it? Such, at any rate, is the pertinent question that arises in the mind of the progressive, educated, and self-respecting gas manager, who stands at the present time like the hypothetical animal between two appetizing bundles of provender, and, like him, runs a great risk of starving himself through inability to prefer either.

The North of England Meeting.

THE members of the North of England Asscciation of Gas Managers met at Middlesbrough on Saturday, under the presidency of Mr. D. Terrace, who delivered the Inaugural Address which will be found in another column. This composition is honourably distinguished from most productions of the kind that have been published of late, in commencing without an apology for its own appearance; and it is to be hoped that all gas managers who may in future find themselves situated similarly to Mr. Terrace

will follow his example in this respect. The first matter of novelty and importance touched upon in the address is the adaptation of the Young and Bell process to the production of gas from tar, as to which several valuable data are given. It would be more especially interesting at the present juncture to know what other effect this treatment of tar in a gas-works would have—say, in regard to the naphthalene trouble. The means of carrying naphthalene safely to the consumer's burner is still one of the crying needs of the gas industry of the greater part of the kingdom. Several other topics of technical interest were suggestively handled by Mr. Terrace—among others, the prepayment meter system; and it was thoughtfully remarked that the introduction of this system puts further opportunity into the hands of the gas manager for interfering, on behalf of the consumer, with the hitherto untrammelled discretion of the gas-fitter in regard to burners and globes. It is perfectly true, as Mr. Terrace says, that the average gas-fitter is utterly careless in such matters. Only recently we had occasion to examine the stock of a suburban tradesman of this order in a large way of business, and discovered that his men were in the habit of putting No. 9 flat-flame burners everywhere, regardless of the consideration that burners of smaller consumption are preferable for passages and other points where only a moderate amount of light is necessary. The excuse was that people generally like a "good light"—obviously a tradition dating from a period when gas companies did not always keep up a good pressure in their mains; but the consequence of the general employment of burners of excessive size upon the consumers' gas bills did not appear to be realized by this representative tradesman. The Association was welcomed to Middlesbrough by the Mayor (Mr. C. Lowthian Bell), and by Mr. Alderman Hugh Bell on behalf of the Corporation Gas Committee; and the day's proceedings concluded with a dinner given at the Fifth Light Buoy on the Tees.

The Meeting of the Commercial Gas Company.

THERE was but a small attendance at the ordinary general meeting of the Commercial Gas Company last Thursday, when the accounts and the report of the Directors for the past half year were received and adopted, and the recommended rates of dividend were declared. Mr. J. Blacket Gill presided over the meeting, and spoke well and clearly, as he always does, respecting the various topics connected with the general working of the undertaking that called for mention by the Chairman. The most important statement from the chair was that it is hoped and intended that the price of gas in the Commercial district will be reduced by 2d. per 1000 cubic feet as from Christmas next. This will be good news for the consumers, who have been sorely burdened in many instances by recent increases; and it will be good also for the Company. To do the Directors justice, they have given abundant proof of their reluctance to advance the price of gas; and there can be no questioning the reality of the Chairman's expressions of pleasure at being able to hold out a prospect of a return to more comfortable working conditions. Mr. Gill spoke sympathetically of the coal miners' strike, and was able to assure the proprietors that this convulsion of the coal trade does not at present affect the Company, who obtain their coal from Durham. He made reference to the candle plague, which is just now acutely afflicting the London gas managers; and he testified to the success that has attended the introduction of "penny-in-the-slot" meters into the Commercial district. Mr. H. E. Jones, the Engineer and General Manager, had an opportunity of referring to the same subject in his short acknowledgment of the usual vote of thanks. Mr. Jones has a knack of neat expression, which he exercises appropriately on these occasions; and he felicitously explained the matter of the automatic prepayment meter by saying that the arrangement appeared to have "caught on" to the working man's fancy. There is everything in the phrase. A meter system, like a book, a play, or a preacher, may be unexceptionable; but unless the fancy of the public—mysterious entity that it is—is taken, the result will be failure. Nobody can say beforehand just what will or will not take. Of a thousand songs intended to be popular, one only will "catch on"—all the rest dying at the moment of production. It is a mystery not to be argued about, but accepted and made the best of, in gas engineering as in other pursuits.

WATER AND SANITARY AFFAIRS.

THERE was a remarkable silence at the meeting of the County Council last week, with respect to the report of the Royal Commission appointed to inquire into the water supply of the Metropolis. But something was on record concerning this subject which escaped general notice, although it possesses a certain degree of significance. There was a report from the Water Committee saying they had met to consider the report of the Royal Commission, but they found the document to be of such "great "length," and its contents so important, that they required more time in order to deal with it. Accordingly, they were "not in a position to make a report to the Council on "the subject," but they hoped "at no distant date" to be able to do so. The report from the Commissioners is plain enough to an unsophisticated reader, but is doubtless rather embarrassing to the Council, who have now to frame a policy under conditions altogether different from those which they had anticipated. They might, if they would, leave the matter alone, for the report of the Commission entirely precludes the idea that their help is wanted. Though nothing is said by the Commissioners as to the right parties to possess the supply, the facts are given in such a form as to show—as inferred by *The Times*—that no change of proprietorship is required. At least this is the case so far as relates to the purity and sufficiency of the supply. The Water Committee are careful to observe that the inquiry was "limited" to these points. We may expect, therefore, to hear something by-and-bye as to the financial part of the question. The rights of the Water Companies, and the legality of their charges, will be reviewed; and, according to what is allowed to appear, we should judge that a waiting and worrying policy—as it may be termed—will be adopted against the Companies. To-day the Council will elect three of its members to serve on the Thames Conservancy Board. Aided by the four representatives from Surrey, Middlesex, Kent, and Essex, the three members sent by the Council are to "make things a little less comfortable" for the Companies than would otherwise be the case. Such is the warning given in a quarter which is evidently more or less inspired in its utterances. While advocating such tactics as these, the oracle admits that all question of a competitive supply must be considered at an end. Wise as to what the Council may intend, there is a strange ignorance as to what the Companies are likely to do. It is expected that these will come forward with offers for the Council to purchase their undertakings. Whatever else is probable, we venture to say this is not. The Companies have no desire to sell. The Council wish to obtain possession; and it is this kind of ambition which has stirred up the whole question, apart from anything affecting the comfort and convenience of the public.

The remarks of Mr. George Banbury, in presiding over the half-yearly meeting of the East London Water-Works Company last Thursday, threw some further light on the subject of the Metropolitan Water Supply, and abundantly confirmed the conclusions arrived at by the Royal Commissioners with respect to the valley of the Lea. The extraordinary heat and deficient rainfall of the past summer afforded a severe test as to the sufficiency of the sources at the command of the Company. If certain supposed experts were right, something approaching to the actual exhaustion of the Lea, owing to the heavy pumping of the East London and New River Companies in a dry season, was an event to be reckoned upon. But nothing of the kind has come to pass, under the strain of seven months' drought, probably for the reason that the Lea was not dependent on the summer rainfall, but was sustained by the water which the chalk had absorbed during the unusually wet months of January and February. That there is something wrong in the theory which governs such calculations as those of Sir John Evans and others, is shown by the contradiction these speculations meet with in the region of fact. Sir John is aghast at the proposal of the Royal Commissioners that 52½ million gallons per day shall be taken direct from the River Lea, in addition to 40 million gallons from wells in the Lea Valley. Yet "A Civil Engineer" writes to *The Times*, showing that in 1891 the New River and East London Companies, unaided by the large storeage reservoirs proposed by the Commissioners, abstracted from the Lea as much as 55½ million gallons per day, without the least injury to the

navigation of the river, or to the health of the large population through the midst of which the stream takes its course. As for the remainder of the 92½ million gallons to be obtained from the valley of the Lea, there is the ever-increasing evidence as to a deep underflow of water, not only feeding existing wells, but providing a supply quite equal to anything the Royal Commissioners contemplate. The recommendations on this point contained in their report are supported by the evidence of Sir F. Bramwell, the late Mr. Hawksley, and other high authorities; while the plain facts narrated by Mr. Banbury, which we record at length in another part of the JOURNAL, point in the same direction. To this we may add that if the Lea is safe under the recommendations of the Royal Commissioners, there can be no fear as to the Thames; and for this inference we can even appeal to Sir John Evans.

Not long ago we had occasion to comment on the dilatory tactics of the Portsmouth Corporation in regard to the proposed purchase of the local water-works. But the story of the acquisition of the Neath Water-Works by the Local Authority of that town has proved to be an even longer business; and, moreover, the final chapter has yet to be written. Still, it would seem, from the report of the town's meeting which appeared in last week's JOURNAL, that Neath is at last within measurable distance of acquiring the undertaking. As long ago as 1861 (just a trifle of thirty years or so), the Corporation obtained conditional powers to take over the works—subject, that is, to the Company giving their consent. In 1874 an effort was made to turn this conditional right into compulsory powers. But the time was not then ripe. The dictum of Lord Derby and his colleagues anent public policy had not in those days been formulated. So there was a gap of ten years more, and even when, in 1885, negotiations were reopened, they speedily fell through, to be feebly renewed in 1889, and once more taken up in the spring of the present year. At length terms were arrived at, subject to the approval of the owners of property and ratepayers in the town. This provisional arrangement has now been confirmed. The Corporation have received a mandate to take the necessary measures to acquire the works (including, if required, an application for parliamentary sanction) "with the least "possible delay." The concluding phrase of the mandate need occasion no surprise, in view of the extraordinary lapse of time which has occurred since first the acquisition of the works was contemplated. After this example, it would, perhaps, be unjust to scoff at the spasmodic negotiations entered into by the Corporation of Portsmouth. Following the methods of the smaller borough, the southern port may, after all, in the distant courses of the future, enter into possession of the Portsmouth Water-Works.

These abortive negotiations for the purchase of water undertakings have become too much the fashion. This or that local authority appoints a committee, sets inquiries on foot, and goes to work in a roundabout way, in order to see what terms it can impose upon a water company. The whole system is harassing and objectionable. By all means let the ratepayers' representatives find out if the works are for sale and on what terms; but, having ascertained these points, the negotiations should be carried to their logical conclusion. Let the matter be placed before the ratepayers themselves, so that their decision may set the whole question at rest. But the truth is that the wire-pullers in provincial towns are often afraid to meet their constituents face to face. They shirk the ordeal of public examination of their schemes; fearing that they may meet with disapproval, or bring odium upon those who have committed themselves to specific terms of purchase. Thus it comes about that projects for purchase are "hung up" for years, greatly to the irritation and weariness of the public, and no less to the inconvenience of directors and shareholders, who never know how soon they may be worried and unsettled by the revival of lame and unpractical negotiations. Yet if town councils could go to work without the concurrence of the ratepayers, there can be no doubt that water companies would be subjected to even more annoying, and vastly more expensive pressure, than they have to endure under existing circumstances. But corporations are weighted with the provisions of the Borough Funds Act. That statute forbids the employment of the rates or other funds under the control of a municipality for the purpose of promoting or opposing any Bill in Parliament unless with the consent of property-owners and ratepayers, which must be given in the prescribed manner. The Act is undoubtedly a thorn in the flesh of the too-enterprising councillor. A few years ago it was sought to have it quietly repealed; but, fortunately for the peace of the water companies, the repealing Bill (the probable effect of which we pointed out at the time) failed to obtain a place in the statute-book.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 689.)

THE general position of affairs on the Stock Exchange has scarcely undergone the slightest change during the past week. Business has been very quiet and featureless, and prices have not shown any tendency to move either one way or the other. At home, the coal strike remains *in statu quo ante*, and railways are losing heavily in point of traffic returns; but stocks hold their own in the market, as holders are not taking fright, and are quite aware that these are not good times for selling. Abroad, the unsettled state of the silver question stops the way in America; and there is little movement in that frequently agitating market. South Americans are not much depressed by the stirring events there enacted; and Australian affairs are looking distinctly brighter. In the Money Market, the expected reduction in the Bank rate was effected on Thursday, when a 3 per cent. figure replaced the 3½. It is just a couple of months since the rate rose by quick steps from 3 to 5 per cent., and now it has as sharply recovered. In the Gas Market there has been much more activity, especially in Gaslight issues. The "A" has undergone a marked revulsion. Soon after the opening, it began to show signs of weakness; and it continued to fall away daily until the closing mark was 10¾ below the opening price, and the quotation had fallen 8. The stock had certainly had a somewhat sharp rise lately; and this is frequently followed by some retrogression, owing to realization of profits. But that will not fully account for so great a relapse. The secured issues, on the other hand, have been particularly firm, and very active also. They all commanded good figures, though only the "J" 10 per cent. showed an advance. South Metropolitans were quiet, firm, and unchanged. Commercials were inactive, but in good favour; the old stock improving a point, and the debenture changing hands at top price. At the general meeting, the Chairman announced that the Board intended to reduce the price at Christmas, if all went well meanwhile. This is good policy; and we hope it may be realized. Seeing, however, that in these times no mortal man can tell what may happen in the coal market in the next three months, the proviso against unforeseen circumstances is only prudent and reasonable. The Suburban and Provincial Companies pursue the even tenor of their way, and offer no contribution to history. Among the Continentals, Imperial started off with an advance, but could not maintain it; and by the end of the week it had lost its gain and another point as well. Union and European were quiet and unchanged. Cagliari rose 1. Of the rest, the Brazilian struggle threw Parà back; while the improved financial feeling in Australia caused Melbourne debentures to advance. Water was very quiet, and almost unchanged—a solitary rise of 1 in Lambeth being the only move.

The daily operations were: The Gas Market opened with some disposition to improve; Gaslight "J" and Imperial Continental rising 1 each, though Parà fell ½. Lambeth 10 per cent. stock rose 1. Business was considerably quieter on Tuesday, and symptoms of weakness put Gaslight "A" down 1. This was followed the next day by a further fall in the same stock of 2 more; but Commercial old advanced 1. Thursday had a similar result—Gaslight "A" receding 2 more. Cagliari rose 1. The downward course of the leading stock continued on Friday, with another fall of 2. On Saturday, sales were unusually numerous at further reduced figures—the closing mark for Gaslight "A" being 226, and the quotation showing a further fall of 1; while Imperial Continental receded 2.

ELECTRIC LIGHTING MEMORANDA.

An Irish Estimate of the Cost of Public Lighting—The Fall in the Price of Incandescent Lamps—What Fixes the Cost of Electricity Supplies.

ONE of the neatest schemes in connection with municipal electric lighting that has ever come under our notice is that of the Corporation of Derry, as reported in the *Irish Times*, which gives great credit to the Corporation for the businesslike manner in which the affair "has been promoted and pushed to its present position." There is nothing exceptional about the generating or distributing plant, which is after the Siemens high-pressure system; and the streets are to be lighted by Brockie-Pell arc lamps. The idea is, however, that all the work is to be done by the Corporation without bringing any additional tax upon the ratepayers; and the trick of this is explained as follows: "It is estimated that the annual payment now made to the Gas Company for street lighting will cover the repayments

and interest of the loan of £15,000 granted by the Board of Works; and after the loan is paid off, the cost of lighting the city by electricity will be only one-third of the cost of lighting it by gas." We do not know who is responsible for this brilliant example of electricians' finance, which is far too good to be left in the decent obscurity of the local newspapers. Whoever it may be, he appears to have conveniently ignored the whole working expenses of the electric light station, and also to have assumed that enough provision will come from some unknown source for keeping the plant intact by the time when the original cost shall have been paid off. Usually the word "depreciation" is a term abhorred by electricians responsible for the accounts of municipal lighting stations; but if they could all get the thing itself provided for on the Derry terms, they would doubtless be glad enough to take advantage of the boon.

An article on the incandescent electric lamp trade, evidently written by somebody who is conversant with the subject, has appeared in the *Financial News*, reviewing the situation created by the impending expiration of the Edison and Swan monopoly. It is remarked that, in preparation for this event, the price of all sizes of Ediswan lamps up to 25-candle power has been reduced to 1s. 9d. retail. The writer questions whether even this reduction is sufficient to retain the trade, seeing that already the Brush Electrical Engineering Company and the General Electric Company are contracting to supply, after the 10th prox., incandescent lamps up to 25-candle power at 1s. 6d. apiece, and German, Swiss, and French competitors are offering the same class of lamp at 1s. each. How much it actually costs to make an Ediswan incandescent lamp of the ordinary size has, of course, never been stated; but in view of the assertion that first-class incandescent lamps of English make can be, and are, delivered in Hamburg at 1s. apiece, it is generally supposed that 9d. per lamp covers the prime cost of manufacturing and putting it upon the market. The Germans are supposed to be able to produce an even cheaper lamp; but, in any case, it is conjectured that in a few months' time foreign-made incandescent lamps will be sold in England for 1s. each, Brush lamps for 1s. 3d., and Ediswan lamps at 1s. 6d. each—and very fair prices too, if the article in question only costs 8d. or 9d. to make. Upon the moot point of the effect of the reduced price of lamps upon the electric lighting industry, the same writer observes that it costs about £70 to wire a house of average size for 50 lamps, and supply the necessary plain fittings. He admits this to be a rough—a very rough—estimate. However, the 50 lamps of this supposititious installation would cost, at the old price, £9 7s. 6d., whereas at 1s. 6d. each the same stock would only come to £3 15s. This is not very striking after all; and so the writer hastens to show that the saving is to be seen more clearly in the matter of renewals. Assuming these lamps require renewing yearly, on an average this expense will soon be reduced in the case of a householder using 50 of them, from £9 7s. 6d. per annum to £3 15s.—certainly a saving, but not one to create a rush of wealthy but economically minded householders to the electric companies' offices with orders for supplies that would otherwise not be forthcoming.

The writer of the article discussed in the previous paragraph, while endeavouring to show that the expiration of the Ediswan lamp monopoly ought to exert an appreciable influence upon the electric lighting industry—a conclusion which he, however, declines to put forward in precise terms, and which we cannot accept—takes occasion to hint that there may be further patents granted for lamps on the Ediswan principle. He says "it is confidently predicted that, before very long, a lamp will be invented having its filament so constructed that it will give a good light with a consumption of two-thirds of the amount of current at present used." One is not unaccustomed to "confident predictions" of electricians respecting all sorts of things that are to come off in the near future; and it is to be feared that the world at large takes these prophecies much more calmly than is quite appreciated by those who put them forward. In the matter under notice, how any man can presume to state that a particular style or pattern of lamp is about to be invented passes ordinary comprehension. It may be true enough that such an invention is greatly to be desired; but experience abounds to show that those obvious *desiderata* which people cry for in public are about the last things to be supplied. It is almost a distinguishing mark of a real invention to be unexpected; and we shall believe in the imminence of such a revolution in the incandescent lamp trade as the *Financial News* writer affects to expect, when it really happens, and not before. It is argued, moreover, that "when lamps consuming only two-thirds of the present necessary quantity of current are invented, the cost of domestic electric lighting will be reduced by one-third, and another great development in the industry will be brought about." This is false reasoning. It cannot be denied that the advent of such a lamp as is here prefigured would have a greater effect upon the electric lighting industry than any possible reduction in the cost of the lamps themselves; but it would not make such a difference to the consumer as this writer imagines. It is not the duty of the lamp, but the cost of furnishing the current, that primarily determines the charge for the latter. If consumers' meters were only to be made to register one-third of their ordinary consumption, the charge for the unit would be put up in proportion. Home-made electricity would be cheapened, of course; but it is mainly commercial considerations that fix the charge for the purchased supply.

THE AUTUMN MEETING OF THE INSTITUTION OF GAS ENGINEERS.

The Second Autumn Meeting of the Incorporated Institution of Gas Engineers was held at Portsmouth on Tuesday and Wednesday last, amid circumstances both propitious and unfavourable. To speak of the former first, it is unnecessary to urge the claims of the Portsmouth, Southampton, and Isle of Wight district as a pleasant land and an attractive centre for the assembling together of few or many genial souls, whether of the gas engineering or any other persuasion, for the purpose of enjoying one another's company. It is indeed a pleasant country; and, with anything approaching favourable conditions in other regards, he must be a dull and a churlish spirit who cannot enjoy a couple of days in it at almost any season of the year. The Institution not only pitched upon an attractive spot for a repetition of their experiment, successful last year, of an autumn meeting; they did more—they got up an exceedingly well-conceived programme, which satisfactorily filled up every working hour of the two days appropriated for the gathering. Last year's meeting was officially restricted to a single day; but inasmuch as the members had to get to Birmingham some time the night before, and there was an informal excursion arranged for the second day, which proved to be very popular, it was not much of an advance to try a regular two days' meeting this year, especially as there was plenty to be seen. The weather, too, was more than usually to be trusted. All things promised well for the success of the meeting; but, unfortunately, other considerations materially affected the result. It was not to be foreseen that many members of the Institution, who can at ordinary times get away from their works for a day or two without much difficulty, would be so seriously troubled by the greatest strike of coal miners of the century, as to be tied, as it were, by the leg to their responsible duty of keeping up the supplies of raw material. To ask a gas manager whose heart is in the coal regions to take a pleasure trip to Portsmouth, after he has perforce cut short his regular holiday, was obviously worse than useless; and yet this is exactly the demand that the awkwardness of Fate and circumstances compelled the Committee and the Secretary of the Institution of Gas Engineers to make on the general body of members for two days last week. The consequence may be easily understood. Letters of apology and excuse for inability to attend reached Mr. Cole thicker than acceptances; and so it came about that the elaborate programme which had been arranged with such care had to be gone through by an assemblage numbering nearer one score than two. Numbers, however, do not count for everything; and it may be truly said that while those members of the Institution who were prevented from going to Portsmouth last week lost a most enjoyable outing, the minority who were able to attend, if only for a part of the time, have every cause to be satisfied with their experience.

Indeed, it is unnecessary to argue that, all other things being equal, an excursion party of manageable proportions is preferable, for those who compose it, to a huge mob that strains the accommodation of a locality, and is bound to split up into sections that are of no comfort or assistance to one another. We should like to have seen double the number of members of the Institution at Portsmouth last week; this much may be said once and for all. But so far as the personal benefit and enjoyment of those who actually were present are concerned, it was a perfectly successful, and in every respect creditable gathering. At any rate, it is greatly to be desired that the Committee will not be disheartened by encountering what was really a coincidence of a particular piece of bad luck, in the matter of the coal difficulty, with the initial trouble of establishing an autumnal meeting. We believe the plan of getting the Association together twice a year is worth sticking to for awhile, in order to prove whether or not it can be satisfactorily worked. After all is said and done, it is the gathering of men together for the sake of mutual confabulation that is the true object of these technical societies; and everybody who knows by experience the benefit of an occasion for talking unlimited "shop," is also aware that this may as well be done while the participants in such talk are sitting together in a break, or pacing the deck of a steamboat, as when the same men are solemnly playing propriety in a lecture hall. The "tip" from a friend respecting the way of settling a troublesome matter of detail is always worth getting; and twice a year is not too often to seek it.

This reflection of course raises the whole question of the absolute and comparative values of the existing means of bringing about these professional conferences. If the Institution of Gas Engineers were the only society of the kind in the kingdom, it might perhaps with advantage meet three times, or even more frequently, during the year. But, taking the facts of the case into account, can the Institution justify its existence and its bi-annual meetings? This is a question that is continually being asked by those who, having the best interests of the gas industry at heart, deplore the existing division of the members of the gas engineering profession; and it is certain to be asked with additional emphasis when the smallness of the Portsmouth gathering is generally reported. The question is a delicate one, inasmuch as it involves personal considerations. With regard to the recent Portsmouth meeting, we are bound to bear witness that it, like all other gatherings composed solely of gas engineers and managers and secretaries, was as pleasant

and instructive as any professional man could desire. If the Institution has no other claim to distinction, it has that of freedom from undesirable hangers-on. Its meeting at Portsmouth was "small but select," as the phrase goes; and this not because those who composed it arrogated to themselves the qualification of being "superior persons," but simply because there was nobody present to spoil it.

To give any detailed account of all that was seen and done during the two days would be too great a tax upon our space, especially as only a small portion of the proceedings were of a technical cast. The members met at 10 o'clock on Tuesday morning at the town offices of the Portsea Island Gas Company, which are well situated near the splendid new Town Hall upon which Portsmouth so justifiably prides itself. Here the party was received by Mr. S. B. Darwin, the Company's Engineer and Secretary, and driven to the gas-works. There is nothing specially noteworthy about this establishment (which is, in fact, both cramped for space and antiquated in general design, like too many old gas manufacturing stations) beyond the significant circumstance that the Company are able to make a profit out of gas sold to the Government at 2s. and to private consumers at 2s. 4d. per 1000 cubic feet. From these works a move was made to the railway station, and train was taken for Southampton, where the party was made welcome by Messrs. Lucas and Aird, who are the Contractors for the dock extensions now being made by the London and South-Western Railway Company, under the direction, and according to the plans, of Mr. Galbraith. Mr. Basil P. Ellis, a member of the firm, was present, and personally conducted the visitors, who were also accompanied by the Mayor of Southampton, over the important additions to the dock accommodation which have been designed to meet the growing wants of the Transatlantic trade of the port. The chief work in hand at present is a new graving-dock capacious enough to take the largest craft likely to enter Southampton Water for many years to come. The Union Steamship Company very courteously permitted the visitors to inspect their splendid Cape liner *Scot*, which happened to be the most noteworthy vessel in dock at the time. The remainder of the afternoon was spent at the Southampton Gas-Works, where the visitors were received by Mr. S. W. Durkin, and the admirable appointments of these model works were explained by him. Here tea and coffee were provided by the Directors of the Gas Company, whose kindness was fully appreciated. The return to Portsmouth was made by train arriving at 7 p.m. It was rather a pity that the opportunity was lost for bringing the members together on this evening at a dinner, which need not have been a formal affair.

All Wednesday morning was devoted to a close inspection of H.M.S. *Royal Sovereign*, first-class battle-ship, in commission, but actually refitting preparatory to her autumn cruise as the flagship of Rear-Admiral Fairfax. So much time was taken up in going over the intricate machine which goes by the name of a modern war-ship, that an intended visit to H.M.S. *Vernon*, the head-quarters of the electrical establishment, and the torpedo school, had to be abandoned. From the dockyard the visitors crossed to Cowes, where luncheon, provided by the good offices of Mr. Darwin and the hospitality of the Portsea Island Gas Company, was partaken of with all the gusto generated by an hour's steaming across the Solent in the teeth of a keen wind. After luncheon, the members drove to Osborne House, which, by the gracious permission of Her Majesty the Queen, was thrown open to them. The visit to the mansion and grounds was of exceptional interest, and was alone fully worth the journey to the neighbourhood. After this the party broke up; and the members went their respective ways—one and all well pleased with their trip to the historic and beautiful head-quarters of one-half of the Royal Navy.

The Yeadon Patent Revolving Retort.—We understand that the Belfast Corporation and the Ripon Corporation have recently determined to adopt this arrangement of retort in connection with the projected extensions of their respective works; and we shall await with interest some particulars of the results obtained in this trial of the apparatus on a working scale.

The Case of Disputed Meter Registration.—In the JOURNAL for the 26th ult., we announced that the Brentford Gas Company had given notice of appeal against the decision of the Magistrate at the West London Police Court, in the case of disputed meter registration on the premises of Mr. G. Powell, in the Hammersmith Road (see *ante*, p. 548). We now learn that the Company have been advised that they have no right of appeal.

Petroleum for Removing Boiler Incrustations.—According to the *Journal des Mines*, the officials of the Prussian State Railways have for several years been making use of petroleum in order to remove the incrustations in boilers. The trials have been so satisfactory, that petroleum is now employed in every case where the incrustations are not too hard and impermeable. It is used after washing the boiler, and after the compartments are completely dried; being applied with the aid of brushes, or injected by means of a pump. On some occasions an attempt has been made to make use of petroleum before the water in the boiler has been removed. In this case it spreads uniformly over the whole surface of the water; and when this is allowed to run out slowly, the petroleum fixes itself regularly in the porous incrustations, which absorb it.

NOTES.

The Setting of Lime Mortar.

MM. Letac and Vivien, of Saint Quentin, have recently been exhaustively studying the phenomena of the setting of mortars made with fat lime, of the kind that washes away completely in a sufficiency of water. They remark that mortar of this description never sets at all in contact with water; while, on the other hand, if it is dried too quickly after use it sets, but without any cohesion—the result being merely a mixture of sand and calcareous dust. It is therefore necessary that mortar so composed should be neither under conditions which hasten nor delay its desiccation. That is to say, after use the mortar should preserve a moderate proportion of water, and only lose it gradually. With regard to the solidification of mortar composed of sand, lime, and water, subjected to convenient conditions, it is easy to understand the phenomena which it will present. The water which it contains will dissolve the lime, which will absorb surrounding carbonic acid, and the carbonate of lime will be precipitated in pellicles adhering to the grains of sand. The water in presence of an excess of lime will dissolve a fresh quantity of this substance, which will absorb carbonic acid; and fresh pellicles of carbonate will fasten themselves upon the first deposit, and envelop it. This action will go on until the whole of the mass is solidified. It is not to be supposed that all the lime of mortars saturates itself completely with carbonic acid; for in some instances an exposure of many centuries has proved insufficient for this. Besides, the phenomenon of saturation is not always produced in the same way. Examinations of ancient mortars show that of the conditions favourable to consolidation of mortar, the first is contact with air, from which it can obtain the carbonic acid it needs. Fat lime mortars should never be employed in the middle of thick masses, to which the air cannot have access. The size of the grains of sand, which should be neither too large nor too small, has an important bearing upon this matter. The second condition for the consolidation of mortars is not less important. It consists in the necessity of water being present to dissolve part of the lime. Mortar should not be used too fresh, but only after it has taken a certain consistency due to the evaporation of the excess of water. It should be allowed to set through dessication before it can be trusted to set quickly in the final manner due to the absorption of carbonic acid from the atmosphere.

Tests for Cement.

Mr. Henry Faija, in a paper read before the Engineering Congress at Chicago, discusses the new-fashioned hot test of Portland cement with his own, which consists in exposing a part of the cement on glass to the vapour of water at a temperature of 110° to 115° Fahr. until it is set, and then immersing it in the warm water for 24 hours. If the cement is trustworthy, the pat will be found quite hard, sound, and adherent to the glass. As for the hot-water cement test, Mr. Faija remarks that if a sample of cement is really liable to "blow," his own apparatus shows this equally with the hot test, while the latter may be regarded as unfair to many good makes of cement. As the result of his examination of it, Mr. Faija came to the conclusion that the hot test is not satisfactory. He advises, as the latest word upon cement specifying, that the material should be required to be so ground that it will wholly pass through a sieve having 625 holes to the square inch, and leave only 8 per cent. residue, when sifted through a sieve having 2500 holes to the square inch. Briquettes should carry an average tensile strain of at least 250 lbs. per square inch without fracture at the expiration of three days from gauging, and 450 lbs per square inch in 28 days —the load being applied at the rate of 400 lbs. per minute.

A New Electric Gas.

Mr. M. P. Goff, of Mattituck, New York, has patented in America a curious gas manufacturing process which has been assigned to the National Electric Gas Company, of Kentucky. The apparatus designed by Mr. Goff comprises a pair of cupolas in one setting, whereof one is an ordinary gas producer, and the other is to contain a mixture of limestone, manganese, and salt. The same setting also contains a retort for generating chlorine gas. The three parts of the apparatus are combined by means of flues, whereby producer gas is caused to pass upward through the limestone chamber, and the exit pan of the latter is brought into contact with the chlorine retort. There is an oil supply to the bottom of the limestone chamber; and the object of the combination is described as being the removal of the hydrogen from the cupola gases by means of the chlorine. There is also an oxygen separator attached to the chlorine retort, and also to a pumice-stone retort heated by gas-jets, the exact purpose of which is not clear. It is evident, however, that the gas produced by the Goff system would be of a very peculiar character indeed, and might be styled "electric" gas or anything else without exciting surprise.

Paris Water Supply.—A project is on foot to obtain an additional supply of water for Paris from six springs now flowing into the Loing, near Nemours.

COMMUNICATED ARTICLES.

FOUR YEARS' "PROGRESS" OF WATER GAS.

By R. S. Moss.

In my former article, which appeared in the Journal a few weeks ago,* I incidentally mentioned in passing that water gas for heating had proved just as "successful" as it did for lighting. I intend here to give a short outline of the first, and I believe only, attempt at lighting a mill in this country. It was supposed on its introduction to possess such great advantages over coal gas as a lighting agent that many anxious inquiries were made about it; and altogether the chances of success were most rosy. The public really believed that a new era of lighting would soon begin, and that the *cost* would be so low that existing coal gas-works would not remain long among us—only as deserted ruins, and that another substantial turn of the wheel of progress was about to be made. It is well sometimes for us to pause in the onward rush of our modern everyday life, to look back on that fairy picture, and note how much has really been developed—more especially so when one bears in mind the later picture representing the stormy and distressing events of to-day. Why do we not find our fairy picture fully developed? What causes have operated against it? Can we reasonably expect further development of our picture? These and other questions force themselves upon us as we look back over the last four years. I must leave the reader to give his own answer to these questions from the following simple narrative.

Towards the end of the year 1889, a water-gas plant was erected at a mill in the little village of Oakworth, near Keighley, Yorks. The mill is four storeys high, surrounded by a few cottages, in which for the most part the workpeople reside. Up to this time coal gas had been manufactured on the works; and now water gas was to take its place. With this end in view, the old bench of retorts was taken down; a water-gas generator, with steam-jet, and all appliances erected; the existing purifiers and holder were utilized for the purification and storeage of water gas; and the Fahnejelm system of lighting with magnesium combs composed of rods of calcined magnesia was adopted.

The plant was started towards the end of October, 1889; progress being reported every day. After a few days' run, a report came to hand from the owners of the mill that the light was so bad the workpeople were spoiling the yarn, being unable to see the threads—in fact, they had stated that they could not hold themselves responsible for any work spoiled at such time. The masters had been obliged to allow all who wished to leave work during the lighting period to do so. This was, of course, a serious loss to the firm, besides putting everything out of joint. Further they pointed out that the combs were constantly breaking, scattering white-hot rods of magnesia among the very inflammable material—running great risk of fire, and exposing the workpeople to the danger of being burnt. A fire had actually occurred; and, but for the prompt action of the workpeople, the mill might have been destroyed. They, therefore, called for some immediate assistance. I was instructed to go over to see what could be done; and from notes in my possession I take the following.

On my arrival, I found the gas was being supplied at 1½ to 2½ inches pressure. The consumption was from 3 to 5 cubic feet per hour; but the light was very bad—in fact, in the room on the ground floor, with a consumption of 3 cubic feet per hour, the light could not have equalled 6 candles. Not having a photometer at my disposal, I was unable to measure the illuminating power; but I can state generally that the light was utterly useless to the workpeople. The gas not being governed on each floor, gave increased pressure in every room above the ground floor. There was a difference of from 1½ inches on the ground floor to 2½ inches on the fourth or top floor, with a gas consumption varying from 3 to 5 cubic feet per hour.

After careful examination, I came to the conclusion that it was hopeless to expect success; but, for the sake of experiment, and to give further trial, I changed the burners, and increased the pressure from 1½ to 2 and 3 inches. This, of course, increased the light. In the lower room, the consumption was increased from 3 to 7½ cubic feet per hour, to 11 and even 12 cubic feet per hour in the fourth or top room. Even now the workpeople in the lower room could not do their work satisfactorily, owing to bad light. The life of the combs was also terribly lessened. Breakages now became very common; causing great danger, and loss of time attending to the broken rods of white hot magnesia, and in fitting new combs. These again and again broke off, scattering pieces among the inflammable yarns; and it required all my attention to keep pace in replacing these broken combs. Further the illuminating power rapidly fell away. After a comb had been in use from two to four hours, the light diminished so rapidly that new combs had to be put on. I found that the light, which was very brilliant close to the jet, rapidly lost its diffusive power as the distance increased—so much so that the centre space between two gas-jets was almost dark; whereas coal gas burning 4 to 5 cubic feet per hour gave sufficient light between these spaces, while two water-gas flames, each burning 10 cubic feet per hour, were not more than sufficient. Even then, on account of the light falling away so rapidly from deterioration of the combs, new ones were required almost every day.

This very serious state of affairs—for which unfortunately there was no remedy—was in itself fatal to this system. From the first, it was found impossible to fit the weaving department with this comb method of lighting, on account of the gas-jets standing close to the threads of the warp, and so low that the workpeople often struck their heads against them. Had they been fitted with the combs, they would often have been broken; and the pieces of white hot magnesia would undoubtedly have fallen on the warp, thereby causing fire. The gas-jets in a weaving-mill must, of course, be low, from the nature of the work. Therefore, this part of the mill was closed during lighting hours, until a gas-main had been laid in connection with the nearest main supplying coal gas—that is from the Keighley Corporation Gas-Works.

When I arrived, coal gas was being used in the weaving department and for singeing yarns; and as there were several duplicate singeing-frames, I thought it would be useful to run one of these with water gas, against another run with coal gas. This was done; the gas as it passed to the frames being measured through test meters in each case. I was not altogether surprised to find that, under exactly similar conditions of speed and work done, the consumption of water gas to coal gas was as 3 : 1. It was true the yarns singed with water gas had a better appearance, having an almost polished surface; but at what cost! To prevent the rods of magnesia used for lighting from falling among the yarns, glass trays or cups were put under each burner. But these were found to be useless, as the brittle nature of the rods caused them to rebound, besides cutting off light. Further, the workpeople often struck the "gas-pipes;" and, on one occasion, a boy carrying a basket accidentally struck a branch pipe, the vibration from which caused a dozen combs to break, sending the white-hot rods among the work-people and yarns. This caused great consternation among the workers (chiefly females), who now thoroughly broke down under the tension and strain of suppressed nervous excitement and fear, from which they had suffered during the past week; so much so as to make it utterly impossible for them to continue work under such conditions. This could only have one result, from which we deduce that for lighting mills, or anywhere where the machinery causes much vibration, or where any danger arises of striking the gas-pipes, this method of lighting (for the reasons stated above) cannot possibly succeed.

From this it will be easy to understand the great difference between lighting a mansion or country residence and lighting a mill or business house. At the Leeds Forge, where the same system is at work, the vibration is very small; all the operations being carried on, on the ground floor. The steam-hammer produces the greatest vibration; and this often breaks the combs in its immediate vicinity. But then we have not the same danger here from fire. I feel thoroughly convinced that, for ordinary lighting, this system will never be successful. For country residences, a few ironworks, and the pithead, the light might possibly succeed; but the cost will in almost all cases be greater than coal gas. The extra trouble of fitting combs, &c., the life of which varies so much, and which are far too delicate, will in themselves constitute a bar to success.

The result of this first attempt to light a mill was that further application had to been made to Keighley for a greater supply of coal gas to light the whole of the mill; the water-gas plant having, of course, to be abandoned.

In summing up, these results clearly demonstrate that this system of lighting for everyday wear and tear is a most complete failure: (1) Because of the heavy consumption of water gas, compared with coal gas, for equal illumination; (2) because of the rapid deterioration of the light and consequent enormous expense in combs; and (3) because of the very brittle nature of these combs causing great danger from fire. In conclusion, I might add that a large number of burners were tested at different pressures; the above being the best results obtained.

* See number for Aug. 1, p. 212.

COAL GAS: ITS MANUFACTURE, DISTRIBUTION, AND CONSUMPTION.

A Series of Articles for Gas Students.

CONSUMPTION.

(*Concluded from p. 629.*)

IV.—PRESSURE-REGULATORS, FITTINGS, ETC.

Consumers' Gas Governors.—These are of two classes: Service governors fixed at the meter, for controlling the whole of the supply; and automatic governor burners, which control each light separately. The former are again of two kinds—mercurial, and disc or diaphragm. The mercurial service governor consists of an outer case, provided with inlet and outlet pipes, and in which is contained a metallic bell dipping into an annular trough of mercury. The upper side of the bell is open to the atmosphere, although, to properly protect it, it is provided with a loose fitting or a perforated cover. Provision is made for placing small metallic weights on the bell, as may be required. Suspended from the bell on the under side, is a short spindle carrying a conical valve; the latter working about a suitable orifice and seating, provided in a horizontal partition which

divides the inlet from the outlet chamber of the governor. On gas entering the governor, the initial pressure tends to raise the bell and thereby close the valve. The bell is then gradually weighted, until it allows an outlet pressure just sufficient to supply the requisite number of lights. Once adjusted, it will maintain that pressure whatever the inlet pressure may be—provided the latter does not fall *below* that required on the outlet. Should more gas be required for more lights, another weight will increase the pressure accordingly. Peebles' and Stott's governors are in construction much as the above; but the latter (as also Shaw's governor) is provided with two valves—one each on the inlet and outlet orifices—both being fixed on the vertical spindle, and actuated by the bell.

The diaphragm governor is similar in all respects to the foregoing, except that, in place of the metallic bell and mercurial seal, a horizontal membrane, usually of leather, is fixed. To the centre of this diaphragm a spindle is attached, which carries the regulating-valves. Both classes of governors must be fixed perfectly level, to prevent "binding" of the actuating spindle, and to ensure the correct action of the bell or disc.

The automatic governor-burner provides a means in the body of the burner itself for regulating the quantity of gas passed to 4, 5, 8, or 10 feet per hour, as the case may be. Sugg's diaphragm regulators were amongst the earliest of really efficient governors; but these are now worthily superseded by metallic disc governors. Peebles's needle governor is well known; and the student should examine for himself the sectional illustrations appearing in the JOURNAL. The gas is controlled by the rising and falling of a cone which floats in a gas chamber, rising or falling as the gas pressure is increased or diminished, and in this way opening or closing a valve, and regulating the flow of gas to the burner. It is not a regulator of pressure, but of volume; and the floating cone so regulates and measures the quantity that is consumed, and may be so depended on, that the quantity the burner is rated to pass per hour, multiplied by the number of hours the gas is used, will give the total quantity consumed for any given time. In Sugg's, Borradaile's, and other governors steatite floats are used, which, rising and falling with fluctuations of pressure, open or close small gas-orifices, and thus maintain the correct rate of consumption.

Globes, Shades, &c.—Two or three points in reference to the employment of these aids (?) to successful gas illumination require the attention of the reader. When constructed and utilized in an intelligible, not to say in a scientific manner, these appendages may aid considerably in gas illumination. The far too common narrow-necked ground-glass dirty globe is, however, an abomination that cannot be too strongly condemned; and the manufacturers of elegant chandeliers and candelabra which are fitted for these globes only ought to be "boycotted" by the gas profession. Scientists say the absorption of light passing through the varieties of glass named below, and under conditions, as regards illuminating power and distance from the light, of ordinary coal gas consumption, is roughly as follows:—

	Absorption of Light.
Average sample of sheet clear glass	8 to 11 per cent.
" " ground "	40 to 56 "
" " opal "	55 to 60 "

In actual practice, although the absorption may equal or exceed the above figures, the absolute loss of light is less, owing to certain advantages accompanying the employment of the globes, and also due to the fact that the *curved* glasses absorb less light than sheet glass. These figures do not allow, however, for the dirty condition in which ground-glass globes are generally to be found, and to which may be attributed another 10 or 15 per cent. loss of light. The object of the writer in touching upon this subject is chiefly to point out the enormous advantage to the gas consumer of using the modern shape of globe.

The objections to the first mentioned may be summed up as follows: Reduced illuminating power of the flame itself—due first to cooling of the flame by the rapid rush of air, caused by the contracted opening at the bottom of the globe; and, second, to incomplete combustion of the gas, arising from the same circumstance. Absorption of (say) 33 per cent. by the globe itself of what light is produced inside it. Irretrievable injury to readers' eyesight, caused by the irritating flickering of the flame, due to the aforementioned rush of air. On the other hand, the advantages of a good opal globe of the modern pattern are: Perfect combustion of the gas, with full lighting duty therefrom, owing to the absence of air rushes and cooling draughts. Steady flame of uniform shape. Greater cone of light through the opening at the bottom of the globe, and refraction of light from the inside of the lower portion of the globe. Increase of light within easy distance of the lamp. With a consumption of (say) 5 cubic feet of 17-candle gas per hour, this increase will probably be not less than 40 per cent., compared with an old-fashioned narrow necked globe.

In conclusion, the writer desires to acknowledge much assistance received, during the preparation of the series of articles now brought to a close, from the various sources named, and others; and more particularly to those gentlemen who have, from time to time, personally favoured him with particulars for the purposes of these articles, or who have given permission for the insertion of extracts from their several writings.

TECHNICAL RECORD.

NORTH OF ENGLAND ASSOCIATION OF GAS MANAGERS.

The Thirty-third Half-Yearly Meeting of this Association was held last Saturday, at Middlesbrough, under the presidency of Mr. D. TERRACE, the Engineer and Manager of the Corporation Gas-Works. An earlier start than usual was made; the members (of which there were a large number present) gathering, at eleven o'clock, at the Town Hall, which was opened as a sort of reception-room. When all were assembled, they were shown over the fine pile of municipal buildings by a town official. At noon they repaired to the Council Chamber, the use of which had been granted to the Association by the Corporation.

WELCOME BY THE CORPORATION.

The MAYOR (Mr. C. Lowthian Bell) took the chair, and said that, during his year of office, he had had two very pleasant duties to perform, in the shape of welcoming engineering societies to the town—having, only a couple of months ago, to welcome the Institution of Mechanical Engineers to Middlesbrough. He took it that an organization such as theirs, of gentlemen engaged in so important a manufacture as that of gas, was almost as influential an Association as that of the Mechanical Engineers. It therefore gave him the greatest pleasure, on behalf of himself and the Aldermen and burgesses of Middlesbrough, to give them a very hearty welcome. He personally felt greatly honoured that they had with them the President of The Gas Institute. They were all, at the present moment, regretting the loss which they, as engineers, had sustained this year in the death of a gentleman who, he believed, was a promoter and the first President of the Institute; he referred to the late Mr. Hawksley. The Association was an offshoot of the Institute; and he believed that, of all such offshoots, the North of England Association had done more to promote and improve gas manufacture than any other. He took it that a gas manager had to be, first of all, an engineer; and, secondly, if not equally, a chemist. He thought they had proved this by electing as their Vice-President—and probably as their President next year—a gentleman who was one of the most celebrated men in Middlesbrough, and whose name as a chemist was known probably all over the world—that was, his friend Colonel Sadler.

Alderman HUGH BELL said that, on behalf of the Gas Committee, it was his very pleasant duty to reiterate the welcome which had been offered to them by the Mayor on behalf of the town. It was a great satisfaction to the Committee to see so important an assembly of gas engineers gathered to assist them, by their discussions and by their presence, in the work they had undertaken. It was said, but on this occasion he was fain to believe that the proverb was untrue, that "the shoemaker's wife goes nearest the ground;" because, if it were true, one would have expected that the North of England gas managers, being so near an important coal-field, would have been very backward in the matter of gas making. He was glad to know that this was not the case; and that, being near the coal, they had not thought this their privilege, and regarded it as part of their share of good luck, and so been led to neglect the scientific part of their business. He welcomed them the more heartily because they were about to inspect the plant the Corporation had recently erected at the gas-works under the advice and with the assistance of their Engineer. He read with much interest the account of the last meeting of The Gas Institute in Belfast, when a paper by Mr. Terrace on the subject of inclined gas-retorts was made the occasion of much discussion; and Mr. West would perhaps allow him to say that, of all the speeches on the subject, none were of more vivid interest than the remarks which fell from him. Now, when they had new plant erected, they did not wish to hear the good opinions about it; they wanted to hear the bad ones. Might he venture to express the hope that Mr. West's opinion had ripened, and that he had seen some reason to alter it? It would be, at all events, a very great satisfaction to them, whether he held the same opinion still, or whether he had modified it, if he would give them his views when he had visited the plant. He (Alderman Bell) trusted he was not trenching on delicate ground, nor revealing commercial secrets, when he that Mr. West was not altogether without interest in the erection of inclined retorts at another place; and, as he would not have undertaken, at all events without serious protest, to provide machinery of the character suggested, he ventured to hope that, since the last meeting of the Institute, he had seen his way to reverse his opinion as to inclined retorts. The fact was that out of discussions at meetings such as theirs arose all the improvements which it was possible to make in industrial undertakings; and, for this reason, interested as they were in Middlesbrough in a very important branch of the Corporation undertakings—a portion which yielded them a not inconsiderable revenue—they could not fail to see with pleasure the presence of so distinguished a company as they had with them that day. His brother (the Mayor) had referred to two aspects of the gas manager; he ventured to refer to a third. The engineering and the chemical capacities of a gas manager were beyond all question. There was no doubt that in both of

these he required to be well instructed. But another aspect in which he might be looked at was the relations that must necessarily subsist between him and those in his employment. In the past few years, they had all seen a great change in the conditions under which labour at gas-works was carried on. At the present time, there was no more pressing matter than the finding of the conditions under which the labour employed in the manufacture of an article should be applied in the way which was most advantageous both to the producer and the labourer. It was because it appeared to him that the inclined retort presented one of the solutions of this very difficult problem that he—with great diffidence, so far as his own judgment went—was not unwilling to see the erection of such a plant as they were going to visit. Those who were in the position of having to supply apparatus must approach the subject from a very different point of view; but those engaged in the supply of gas must, he thought, look at it in the way he had indicated.

The PRESIDENT observed that he took it as a personal favour, and he was quite sure the Association felt it a very high honour indeed, that the Mayor had attended their meeting to welcome them; and he had, in the name of the Association, to thank him.

Mr. J. WEST (Manchester) expressed his great pleasure at having the opportunity of being present. He said his Worship had referred to a very old and esteemed friend of theirs—one of the promoters, if not the promoter, of the Institute which he represented that day. Mr. Hawksley was the President for three years; and, during that period, the Institute made great progress, although it took a very long time before it gained a considerable following. They were now a very large body indeed, representing most of the towns in England. As to Mr. Hawksley, he could only say that all who were acquainted with him knew him to be a man of intelligence and ability. He himself had known him for many a year, and had the pleasure of meeting him often—sometimes in opposition, which was not very pleasing, because he could be very severe to those who were opposed to him, though afterwards he was all friendliness and kindness. Mr. Hawksley had left his works behind him. At Nottingham, Derby, and other large towns, they would see works which would remain a monument to him long after the designer had gone from among them. He (Mr. West) was pleased, as father of the parent Institute, to come to the North to welcome its loyal sons. Of course, they were all present there as free lances, and to give free expression to their opinions. He had never hesitated to do so. He was prepared to repeat what he said at Belfast. He said it conscientiously; and he could only say that he was, on that occasion, much pleased that Mr. Terrace brought forward something very tangible. It was the first time that they had before them anything like figures showing the application in detail of the process; and he believed that the figures then presented, and the economy shown, would be still further reduced. They need hardly take it that because he was putting up machinery for inclined retorts, he accepted everything that was being done in that line. An engineer might be putting up inclined retorts, and, if he asked him (Mr. West) to supply the machinery for the working of them, why should he not do it? He might advise companies and corporations as to what was the right thing to adopt; and if he thought one thing was better than another, he would be obliged to recommend it.

NEW MEMBERS.

The PRESIDENT having taken the chair,

The HON. SECRETARY (Mr. W. Hardie, of Newcastle) submitted the names of the following gentlemen, who were unanimously admitted to the Association: Member: Mr. G. W. Young, of Harrington. Associates: Mr. W. Phillips, of Sunderland; Mr. J. S. Walton, of Corbridge; Mr. W. T. Grahamsley, of Morpeth; Mr. G. T. Duncan, of Birmingham; Mr. M. W. Helps, of Leeds; and Mr. John Mackay, of Edinburgh.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

In presenting to you to-day a few passing thoughts on current methods of work in our industry, that may prove of interest and perhaps value, allow me first to thank you for the honour conferred in electing me to preside over your deliberations during the year. I intend, however, only to touch upon such subjects as are most prominent, or engaging our attention in a most marked degree at this time.

Competition and rivalry are hard at work; and this is exemplified not only in having to meet our "pale brother," electricity, in the field, but also in being confronted with so many different methods of work in our everyday labours, that it is often very difficult to choose the best in the interest of company and consumer. This can only be done after thorough and exhaustive investigation. Even then different conclusions are arrived at by different investigators—perhaps owing to the different conditions and circumstances under which they are working. It is one thing to prove, or have the courage to adopt, a principle, but quite another to work it out to its natural conclusion. The latter element is in a sense more important than the first; for the development of many a good invention has been ruined in its application or by carelessness in working.

The more recent forms of carbonizing processes are all more or less familiar to you. To-day, inspection is being made of the inclined retort system which has been adopted here, and on which a paper was read by the writer at the Belfast meeting of The Gas Institute in June this year. It is a mode of relieving arduous hand-labour by what may be termed "stationary machinery" and the law of gravitation. This principle is easily adapted to moderate-sized works as well as to large works; whereas charging and stoking machinery "on wheels" may be more applicable to the larger works, where it can be kept constantly employed on a sufficient number of retorts to make it profitable.

Another method of carbonization is claiming attention at present, in the Yeadon revolving retort, a paper on which was read by me at our April meeting in Newcastle-upon-Tyne. After pointing out the several advantages accruing from this system, the results of the experimental work were given, and fully discussed. We are now waiting the practical outcome of actual work in some towns where it has been decided to adopt this form of retort.

A new departure in the production of illuminating gas from liquid hydrocarbons has lately been introduced in what is known as the Peebles process (Young and Bell). Hitherto the method of manufacturing gas from liquid hydrocarbons has consisted in running or injecting into the retort or oil-decomposing arrangement, the liquid hydrocarbons at such a rate in relation to the temperature of the retort or decomposing vessel that it was, as far as possible, converted into gas at one operation. Considerable difficulty has been experienced in the adjustment of these conditions. If the rate of injection of the hydrocarbon was too fast, oil escaped decomposition—entailing waste; and, on the other hand, when the flow of oil was too slow, the hydrocarbon was over-decomposed, and there was formed soot and pitchy matter, which clogged up the apparatus. So great, indeed, was the difficulty experienced, especially with tars and oils containing a large quantity of carbon, that they have not been hitherto available for the production of gas upon a commercial scale. By the Peebles process—by which the difficulties are completely overcome—the oils or tars to be gasified are purposely allowed to flow, or are injected into the retort at such a rate that only a fractional part is decomposed each time it enters the retort. The large quantity of oil or tar leaving the retort ungasified during the process of condensation, serves as the agent to wash out of the gas the condensable vapour, and to hold in suspension any sooty matter; and it is, along with the fresh oil or tar, made to flow back against the current of gas, and is run or injected a second time into the retort. The process of alternate fractional decomposition and condensation goes on till the hydrocarbon is split up into gas and coke.

This method would appear to be suited to the gasification of all descriptions of liquid hydrocarbons—from the purest petroleum to the crudest tar. The higher grade of oils would produce gas of very high illuminating power, suitable for enriching coal gas; while the cruder tar from our coal-gas making yields a gas having an illuminating power considerably higher than the gas produced from the coal from which the tar was obtained.

The process is also exceedingly simple, and is likely to prove of considerable value, in giving us in future the power to check the ransom prices of cannel coal and enable us to keep up the value of tar. It has always appeared to me to be bad policy to import cannel, and so pay equivalent to 2d. to 4d. per candle for (say) the seventeenth candle; while we sell the other sixteen at the rate of 1½d., when using the coal from the nearest sources. When, however, the enrichment can be done by means of oil or tar—as is accomplished by this process—at, or even considerably under *pro ratâ* cost, the circumstances are different. It might then be desirable, for various reasons, to supply a higher quality of gas. Situated, however, as a large number of gas managers are, requiring to supply gas only of such a quality as can be easily produced from local coals, their interest in the process will centre in its application to the production of gas from tar, and especially at the present time when tar and tar products are at such a low price.

That being my own position, I have obtained analyses of results bearing upon the subject. From a ton of tar derived from South Durham coal was produced by the new process (when gasified) 13,965 cubic feet, of 24·1-candle illuminating power, and 15 cwt. 1 qr. 2 lbs. of coke. From a ton of tar from Yorkshire coal, from a gas-works using a percentage of Nottingham cannel as an enricher, was produced 14,414 cubic feet of gas, having an illuminating power of 25·1 candles, and 15 cwt. 2 qrs. 4 lbs. of coke. The coke from both tars was of fine quality, containing very little sulphur and less than 1 per cent. of ash—principally oxide of iron

The value of tar as a gas producing material will, of course, vary—dependent on a variety of circumstances, such as location of works, influencing cost of coal and sale of coke and tar; and in the case of works distilling their own tar, only those parts of the distillation having a low commercial value would be worked up into gas. Creosote oil yields about 16,880 cubic feet of gas of 28-candle illuminating power, and 10 cwt. 3 qrs. 9 lbs. of coke. Applying these figures to your individual circumstances, you will be able to calculate out for yourselves the value of your tars as gas producing materials. I may mention that Russian residuum yields, per ton, 21,385 cubic feet of 70-candle gas, and 660 lbs. of coke.

At the summer meeting of the Institution of Mechanical Engineers, held here, a paper was read by Mr. Jeremiah Head,

on "Cleveland Industries," in which reference was made to the great benefits obtained by the use of the Le Chatelier pyrometer in controlling smelting operations. The apparatus, which can be made self-recording, may be connected by conductors to the manager's office. Such an instrument applied to our retort-settings, would be of great value; as it is equally imperative that our carbonizing operations should be conducted with all the regularity that pertains to that of blast furnaces and similar work. A description of the apparatus, as given by Mr. Head, will be interesting to you. He says: "The perfect control of smelting operations has hitherto been rendered impossible or difficult, for want of an instrument capable of indicating high temperatures with accuracy. Such an instrument can now be obtained in the Le Chatelier pyrometer, on which a paper was read before the Cleveland Institution of Engineers in November last, by the Mayor, Mr. Charles Lowthian Bell. A thermo-electric couple of platinum and platino-rhodium wires is inserted permanently in the blast main, or in any of the gas down-comers; and it is connected by conductors with a galvanometer placed in the manager's office. The galvanometer, by means of a twisting mirror, causes a beam of light to fall upon a scale, from which the temperature is read off. On the improved plan devised by Professor Roberts-Austen, the beam of light, instead of falling only upon the scale, is caused to act on sensitized paper, coiled on a clock-driven barrel. On this, it traces a continuous curve, recording autographically every change of temperature. A complete check is thus provided day and night upon the operations of the furnace-men; and a clue may be obtained to the causes of troubles, and their remedy be facilitated, in a way which otherwise would not be possible."

The principles which govern the condensation and scrubbing of gas are fairly understood, and no doubt acted on to a greater or less degree. But I think that, though much has been said and written on purification proper, there is not such a decided opinion as to the best methods of working. We are all agreed that the efficient and economical way in which this is carried out is a matter of great importance, not only in regard to the purity of the gas, but also as to the cost in wages and material. There can be no doubt that the gas may be most economically and efficiently purified when a small percentage of air is used as an aid to purification, and that without diminution of illuminating power. The air may be either forced in at the purifiers or drawn in at the exhausters—the latter being the preferable mode. With such an arrangement, double the quantity of gas has been purified per change, and the sulphur compounds (which previous to introducing air could not be got below 35 to 40 grains) reduced to 14 to 18 grains per 100 cubic feet of gas. The cost in wages for purification is also considerably reduced—indeed the total cost for purifying, including wages and material, being a little under ½d. per 1000 cubic feet of gas. This clearly shows that by using a small percentage of air—say, from 1½ to 2 per cent.—gas can be not only very economically purified, but sent out to the consumers almost entirely free from sulphur compounds. I think this also shows that expensive and complicated plant for the manufacture of oxygen, to aid in gas purification, need not be incurred, when the small cost of a meter fixed to the outlet of the condensers is all that is necessary to regulate the quantity of air drawn in.

You are doubtless all familiar with the efforts which have been made by Mr. William Cowan, of Edinburgh, in the direction of automatically regulating pressure in distribution. His latest system is to apply an auxiliary small gasholder (or regulating vessel) connected to a main at a remote point from the works' governor. The auxiliary gasholder in its rise and fall, according to the pressure in the district, operates water-valves for loading and unloading the governor. This is accomplished in such a way that a certain equal pressure is constantly maintained automatically. The invention also includes provision for the automatic alteration of the normally constant pressure, in the event of such alteration being found necessary.

The use of "penny-in-the-slot" (or prepayment) meters is now past the experimental stage, as large numbers of them are being fixed in some of the principal, as well as in the smaller towns. They are simply a means of selling gas retail instead of in bulk, with the usual consequence of the consumer having to pay an enhanced rate for the accommodation. It appears, however, that this is cheerfully done; so we need not on that account adhere entirely to meters in their usual form. The use of these new meters is promoted in order to increase the sales of gas; and one great advantage should accrue in respect to the better development of the gas into light, which is still a matter of chance on the part of the consumer. Gas companies in supplying fittings should see that not only has a certain number of feet of gas been given for the penny, but opportunity should be taken of fixing proper burners, adapted to the pressure and light required, which circumstances are entirely overlooked by the average gas-fitter to the detriment of the average consumer. For notwithstanding all that has been done by way of instruction by gas companies in this respect, ignorance and waste prevail. Consumers are still heedless of the fact that any slight variation in the quality of gas is as nothing compared to the wasteful means they use in consumption—any difference in quality not ranging more than 5 per cent.; while badly applied burners are destructive of light to the extent of at least 30 per cent. An additional 30 per cent. loss is also entailed by the use of globes of the old type.

After the very able exposition of "Gas *v.* Electricity" by the President of The Gas Institute (Mr. Denny Lane) this year, at Belfast, I fear there is little ground for me to touch on the subject. I should like to reiterate, however, in as clear a manner as possible, the relationship in the cost of the rival lights to the consumer—*i.e.*, light for light. This has hitherto been stated more or less clearly, and sometimes with a certain vagueness on account of the technicality of the subject. Perhaps the following table will emphasize the information in as lucid a manner as it can be stated:—

Comparative Cost of Gas and Electric Light.

Electric Lighting at 6d. per Board of Trade Unit.		Gas (16-Candle) at 2s. per 1000 Cubic Feet.				
		Ordinary Open Flames given by Burners.		Standard Argand Burner.	Regenerative Lamp.	Incandescent Gas Light.
		As commonly used.	Adapted to Pressure of Gas and Light required			
Number of Units said to be Equivalent to 1000 Cubic Feet of 16-Candle Gas.	Cost.	Candle Power per Cubic Foot of Gas Consumed.				
		1½ to 2	2½	3½	10	20
Allowed by Board of Trade 10	5/-	3/10	2/4	2/-	-/8	-/4
Practical men estimate 12½	6/3					
One-sided advocates say 6	3/-					

It is thus that electricians compute (the 3s. 10d. against the 3s.) the cost of their light being "cheaper than gas." Their assumption of 6 units instead of 10 units, allowed by the Board of Trade as being equal to 1000 cubic feet of gas, is a wilful playing with "standards of light." It is, however, done with the greatest *sang froid*. Were the gas industry to be as guilty of misrepresentation, it could with all reason adduce the latest development in economical lighting by gas—viz., the incandescent light, which reduces the cost to one-sixth of our standard, or one-fifteenth of the cost of electric light. The fair way to put it, however, is: Gas standard, 2s.; electric light standard, 5s.—*i.e.*, electric light two-and-a-half times the cost of gas, light for light.

There are about 600 towns which may be expected to use the electric light, if it were a success commercially; but only 5 per cent. of these as yet have each a comparatively small installation. The average proportion of light in such towns is 2 per cent. electric light and 98 per cent. gas light. Taking the proportion of electric lighting for the whole country, we find it to be 1 per cent., against 99 per cent. of gas light in use. This year 18 towns have applied to the Board of Trade for powers, against 24 the year before—out of the 300 to 400 which "intended" to apply. As the number of towns experimenting with the new light is in a decreasing ratio, this shows that it has reached its level, and that it now appears in its proper guise in the estimation of those who may adopt it, if not in that of the electrician and capitalist.

I would commend those towns about to adopt an electric light installation to note what was published a few weeks ago from the home of electric lighting—America—where it has got such a foothold; gas being three to four times the price paid in this country. It is said that "33 out of 56 electric lighting companies doing business in Massachusetts did not pay any dividend last year, while the average dividend paid for the year by the whole 56 companies [as many as are working in this country] was only 0·0235 per cent."

In these few sentences, I have endeavoured to place before you the status of the gas industry in regard to its manufacturing and distributing plant, as well as to our rival in the field—electricity. The adoption of prepayment meters, meets the case of a greater competitor—oil—for domestic lighting. It also would soon fail, so far as economy goes, were gas consumers alive to the fact that they could light their houses, even with ordinary open-flame burners, at least 30 per cent. cheaper than they do at present, by simply using burners properly adapted to their requirements. It is well known that gas of (say) double the quality we supply is often deteriorated to less than half its value by consuming it under high pressure and in small burners; whereas both it and poorer quality gas can be readily made to give greatly increased lighting power, according to the means taken to secure this.

The future of electric lighting may be briefly summed up in the words of that great scientist, the late Sir C. W. Siemens, who said, when he was President of the British Association, in 1882-83: "Improved gas lighting may continue its rivalry with electric lighting, both as regards economy and brilliancy, and such rivalry must result in great public advantage."

Mr. J. Hepworth (Carlisle) said he had been asked to voice what he knew would be the unanimous feeling of the members of the Association, in proposing a hearty vote of thanks to the President for the excellent and very able address to which they had just listened.

Mr. T. Trewhitt, J.P. (West Hartlepool), seconded the motion, which was unanimously agreed to.

Mr. G. R. Hislop's Patent Retort-Settings.

The discussion on the paper by Mr. Er W. Smith on the above subject (read at the last meeting) was then taken. Our report of it will be published next week. At the close of the debate, a hearty vote of thanks was passed to Mr. Smith.

Gas Undertakings in Relation to the Use of Gas-Engines.

On the *agenda*, it was intimated that Mr. H. Lees (Hexham) would read a paper on this subject; but the time at disposal was too short to allow of it being considered by the members. It has, therefore, been judged advisable to hold the paper over from publication until after the next meeting of the Association, when it will be read, and at once discussed.

The President having thanked the Mayor for his kindness in allowing the members the use of the Council chamber for their meeting, the business proceedings terminated.

Visit to the Gas-Works.

The members then walked to the gas-works, which they inspected; paying particular attention to the benches of retorts which have recently been erected on the inclined system. In the office, samples of coke from coal, Russian oil, and tar were exhibited, and attracted some notice.

Shortly after two o'clock, the company were conveyed down the river, on one of the steam vessels belonging to the Tees Conservancy Commissioners, to the Fifth Buoy, where, in a building erected upon a staging in the middle of the estuary, they had dinner. The usual toasts were given; but the proceedings at the close had to be somewhat hurried in order that the return voyage up the river—a distance of seven miles—might be completed in time to enable the members to catch trains connecting at Middlesbrough with the north and south going expresses.

GAS SUBSTITUTES.

The Hydro-Oxy Oil Gas Process.

In last Tuesday's Journal, we gave the text of a paper on the above subject which was read the previous evening, by Professor Vivian B. Lewes, at the meeting of the Society of Engineers, at the Westminster Town Hall. The discussion mainly turned upon the subject of the treatment of oil gas with oxygen, and will be read with interest in conjunction with the article which appeared in last week's issue on "The Tatham Process at Huddersfield."

Mr. W. R. Herring, the Engineer of the Huddersfield Corporation Gas-Works, said Professor Lewes stated in his paper that the addition of oxygen to rich oil gas, by increasing the rate of combustion, "enables the gas to burn at a far larger burner than would be possible with oil gas alone; and an increase of sometimes as much as 25 per cent. in the illuminating value can be obtained." Then he went on to say that "such a gas would be useless for enriching purposes, as the oxygen which, with the rich gas, perfected the burner, and so gave an increase of illuminating value, would, when the gas came to be diluted with poor coal gas, overdo the combustion, and would cause a loss rather than a gain in illuminating value." This appeared to be a very sweeping assertion; and he was forced to conclude that Professor Lewes had not had much practical experience with the oxy-oil gas process. He (Mr. Herring) had devoted considerable attention to it. In December last, he spent a week at the experimental plant erected in Salisbury Square by the Hydro-Oxy Gas Company; and he would briefly refer to the results he then obtained, and afterwards to the results of their practical working. In some experiments made in May of last year, by adding 5 per cent. of oxy-oil gas—that was, oil gas with 15 per cent. of oxygen—14·5-candle coal gas was enriched to 18·38 candles, or an increase of 26·7 per cent.; in November, 15·12-candle gas was enriched to 18·9 candles, or 25 per cent.; and in December, 12·56-candle gas was enriched to 16·61 candles, or 32·2 per cent. These tests proved that the poorer the coal gas, the greater was the effect of the oxy-oil gas. It was, however, very remarkable that the ratio of the increase in the results obtained was very uniform in proportion to the luminosity of the original gas. The next point to which he wished to direct attention was the permanency of the gas or otherwise. He found by experiment that it was greatly superior to gas enriched by cannel, and also to ordinary coal gas. He took various samples of the gas, and sealed them up in small gasholders, and left them for more than six days. Coal gas, after standing over water for that time, depreciated from 15·32 to 12·94 candles; losing 2·38 candles. The coal gas enriched by cannel depreciated from 15·43 to 10·93 candles; being a loss of 4·5 candles. Coal gas enriched by 5 per cent. of oxy-oil gas depreciated from 15·39 to 13·88 candles, losing 1·51 candles. These tests were very severe, because there was so much exposure to the water and surface of the holder—more than there would be in practical working. The figures he had given were the results obtained by experiment. But in May last, they commenced the erection of plant at Huddersfield; and they adopted the retort which had been patented by the Northern Counties Hydro-Oxy Company. Unfortunately the form of this retort was such that it did not admit of any expansion. It was a four-way zig-zag retort; and, when expansion was taking place, there was constant springing of the joints, and it was impossible to keep the apparatus tight. They devised a different set of retorts altogether, and provided for the expansion which must, of course, take place. These had been in operation a fortnight; and he would give a brief account of what they had done. During that time they made 244,600 cubic feet of oxy-oil gas—that was, with 15 per cent. of oxygen added. In their No. 3 retort-house (which was not fully at work), they had made 4,103,000 cubic feet of coal gas, so that the oil gas made and added to this was equal to 5·96 per cent.; and they had obtained an average increase in illuminating power of 5½ candles. This, as far as it went, overstepped the results obtained on a small scale; and he anticipated that, when they got into regular work, they would do much better than with the small experimental plant. He should add that this gas contained 3 per cent. of cannel gas. Owing to the difficulties with regard to coal in the neighbourhood, they had little coal left at the present time; and having a fair supply of cannel, they had been using it up to about 30 per cent.—that was, Yorkshire cannel. Professor Lewes seemed to think the process was no good at all. But he thought, from what he had seen of it so far, that there was not the slightest doubt it was a very important advance in regard to the enriching of poor coal gas; and shortly, they would know more about it than now. So far as they had gone, there was no doubt whatever in his mind the gas was permanent. They had had no condensation from the street syphons, and no more than usual from the gasholder syphons—it was water condensation rather than oil. He had a jet photometer in his house, which was about 1¼ miles from the works; and the difference in the illuminating power was no more than with ordinary gas, if so much.

Mr. H. O'Connor remarked that he had had some experience in the erection of the Lowe plant. He noticed that Professor Lewes said he obtained with his apparatus a result of 1333 candles per gallon of oil; and he might mention that recently in ordinary working with the Lowe plant something over 1300 candles had been realized. Another matter was as to the cost of the Lowe plant. He should like to know what Professor Lewes included in the £900 he quoted.

Professor Lewes: The general fittings to the generator, superheater, and so on.

Mr. O'Connor: Then for that the cost of the Lowe plant would come to between £300 and £400.

Mr. C. Gandon, the Engineer of the Crystal Palace District Gas-Works, agreed with nearly all that Professor Lewes had said. During the past year or two, gas makers, he remarked, had had to consider the means by which they could increase or maintain the illuminating power of gas at the cheapest possible cost. In former years cannel coal had been their servant, until it went up to an outrageous price. Then came these mineral oils; and they had given them the hope of being able to enrich coal gas without the aid of cannel. He believed he had had as much experience, or tried as many experiments with these oils as most gas managers. He had tried running them into the retorts and distilling them, but with very unsatisfactory results. The conclusion he came to was this—that, when they distilled the oils at a low temperature, they re-condensed; while, if they adopted a high temperature, they blocked up every pipe in the place. These were the conclusions he came to, he might say, twenty years ago; and he held them still. They could enrich their gas with these oils, but they required to be very carefully used. Then he came to the water-gas processes, which were all very pretty. He remembered going to see the Van Steenbergh apparatus when it was in operation at Knightsbridge. It worked admirably; but it did not tempt him to adopt it. He had also seen the plant in use at Beckton. It worked very well; but he did not yet know the cost.

Professor Lewes: I think about 2s. per 1000 cubic feet of gas is the accepted figure.

Mr. Gandon (proceeding) said, of course, that depended upon the cost of the oil. However, oil was doing something for them in the way of reducing the price of cannel; for only that day he had had offered to him some cannel which a year ago would have been 10s. dearer. As to the hydro-oxy gas process, there might be something in it; but he had not been able to discover it yet. He believed, however, that there was a field open to gas managers in the enrichment of coal gas by means of oil.

Dr. Leonard T. Thorne remarked that Professor Lewes had stated in his paper that, for enrichment purposes, oxy-oil gas was useless. To this he gave an emphatic negative. He had worked a great deal on this subject on a small scale; and he had obtained results which left no doubt in his mind, not only that it could be used as an enricher, without any loss of illuminating power, as Professor Lewes seemed to insinuate, but that it could be used with a very great gain of illuminating power, and could be employed as a very valuable and important enriching medium. He did not intend on this occasion to go into details. It would take up too much time; but he hoped, in the course of a few weeks, to be able to lay before the gas profession some further particulars, and then go into the whole

question more completely than it would be possible for him to do at that meeting. But he wished to give one or two figures which were diametrically opposed to the insinuation made, in a rather *ex cathedrâ* manner, by the author of the paper. He (Dr. Thorne) made some experiments at a time when he had the advantage of the great cold of last winter for the purpose of testing—on the one hand, the enricher, and on the other, the stability of the oxy-oil gas. Working on a small scale, with the conditions disadvantageous to the best product of oxy-oil gas, he obtained a minimum of about 3½ candles of illuminating effect by enrichment by 5 per cent. of oxy-oil gas. He did not think that a practical gas manager would think that any addition of 5 per cent. which would give 3½ candles increase in illuminating power could be said to be useless. He might mention that this increase of 3½ candles was when used with an Argand burner; with a flat-flame burner, the increase that he obtained was very much higher. The gas so enriched proved itself to be more stable than the poor coal gas before its enrichment. The coal gas he took for these experiments varied, under different conditions in different experiments, from about 12 and 13 up to 15 candle power. He found that, on keeping these various gases in small holders over water, and subjected to considerable variations of temperature and great cold—conditions which he thought were rather severe—the unenriched gas averaged a loss, in the course of three days, of about 1·3 candles; while the same gas, enriched with about 5 per cent. of oxy-oil gas, lost about 0·95 candle, and, when enriched with about 10 per cent., only 0·5 candle. Not only did they obtain no extra loss in the enriched gas, but they had really a diminution in actual loss of from 1·35 candles to 0·5 candle. These results were, as he had said, under conditions which he believed then, and believed still, were disadvantageous to the oxy-oil gas. Results were now being obtained on a large scale. The apparatus was not yet quite in complete working order; but Mr. Herring had been able to give them some preliminary figures which he considered would very closely approximate to the average working, and he (Dr. Thorne) saw they gave a considerably higher illuminating gain than those he had obtained. He expected, when they came to favourable conditions on a large scale of working, they would get better returns than he had realized. Even the mean results he obtained on a small scale were sufficient to make the process a valuable one to gas managers; and he hoped before long to be able to give further figures from his own work both on a small and a large scale. He was certainly inclined to think that Professor Lewes would have to very seriously modify his opinion upon this subject before he next read a paper before the Society.

Mr. T. S. Lacey, of the Pimlico works of The Gaslight and Coke Company, referring to the statement by Mr. Herring in regard to the loss of gas stored in small holders, thought it ought to be pointed out that gas was not so unstable that it lost, under ordinary working conditions, anything like so large a quantity as mentioned. It was certainly true that coal gas would lose its illuminants by being passed over water or subjected to washing, as stored gas would be in small holders. It would be a larger loss than would occur in distributing it to the consumer—it was quite a different thing to supplying it in the usual manner. There were two ways in which loss might be occasioned—one was by taking such a low temperature that the gas would deposit its hydrocarbons; and the other was by passing it over liquid that would act as an absorbent. In ordinary cases, gas as now supplied was sufficiently stable for general purposes; at all events, he contended that the London gas was. One of the tables which Professor Lewes exhibited, but it was not included in the paper, was very interesting, looking at the fact that they used naphthas for carburetting gas. There was an extraordinary difference in the value, as far as he could see, of the different hydrocarbons as enrichers. There was one oil of ·875 specific gravity, with a boiling-point of 110° C., and a percentage increase of illuminating power of 8·81 for each grain per cubic foot. Then there was another of ·827 specific gravity, with a boiling-point of 115° C., and a percentage increase in illuminating power of 3·43 for each grain per cubic foot; and another of ·676 specific gravity, with a boiling-point of 40° C., and a percentage increase in illuminating power of 1·80 for each grain per cubic foot. As regarded the cost of manufacturing oil gas, it had probably been reduced since Professor Lewes obtained the price he had quoted.

Mr. C. Harris observed that the cost of 2s. per 1000 cubic feet which had been mentioned had now been reduced at Beckton to about 1s. 8d. per 1000 cubic feet for 25-candle gas. He also noticed that Professor Lewes stated that, in the Lowe and Springer processes, there was a large proportion of illuminating oil gas swept out with the blast. This was not now the case. The oil, two or three minutes before the end of each run, was shut off, and, before the air-blast was put on, all the illuminating vapour was swept out by the steam. He also saw that in Professor Lewes's apparatus he took his superheating steam in half way up the fuel bed. [Professor Lewes: Only the portion used for injecting.] The author of the paper also stated that the whole of the oil-gas plant of The Gaslight and Coke Company was erected under the supervision of Mr. Glasgow. It was true that he put up a plant equal to a million cubic feet per diem; but the Company had since erected plant capable of producing 9 million cubic feet. In reply to Mr. Gandon, he added that 1s. 8d. was the cost of the gas into the holder.

Mr. W. Sugg wished to ask a question of Dr. Thorne relative to his remark with regard to the flat-flame burner giving a light, with the enriched gas, better than the Argand burner. What he desired to know was the relative size of the slit used in the flat-flame burner and the relative height of the flame in the Argand burner. He presumed that Dr. Thorne referred to the "London" Argand burner. If this was used with any quality of gas, except 16 candles, it should always be brought up to the 3-inch flame, and the difference calculated out; and it would then, in all probability, be found that the Argand burner would give the best result. It was an uncertain thing to use a flat-flame burner for testing gas, as the least alteration of the slit would make a serious difference in the illuminating power. If a "London" Argand burner was used with a 3-inch flame, they would find it would test the gas more correctly than when they used it with 5 cubic feet. It was made for a 3-inch flame; and directly they got below or above it, the conditions of the air supply were altered, so that the calculation would go wrong.

Dr. Thorne said he would just like to say that, in the experiments he had made, he worked exactly on the line indicated. Working with a "London" Argand burner, and a 3-inch flame, and calculating the quantities, he obtained the best results. He was afraid that, in the remarks he made with regard to the illuminating effect being greater with the flat-flame burner, he did not make himself quite clear. What he intended to convey was that, if he burnt gas in a flat-flame burner, in all cases he obtained a very much less good result in illuminating power than from the Argand burner; but the same gas burnt through a flat-flame burner showed a larger increase from the addition of the oxy-oil gas than it did with the Argand burner. Supposing the flat-flame showed 10 or 9 candles per 5 cubic feet against some 12 candles with the Argand, the increase would be nearer 4 candles than 3½ candles with the addition of the oxy-oil gas—the effect was more marked in the case of the flat-flame than in that of the Argand. He believed the explanation was simply the fact that the flat-flame burner was much less suitable for burning gas for giving the full illuminating effect than the Argand, but that the defect was somewhat remedied when the gas was enriched with the oxy-oil gas; so that the latter made the former more effective for its purposes than it was without it. In referring to the loss of illuminating power of gas, he did not intend to represent that this large loss was the normal loss for coal gas under ordinary conditions. He merely gave it as the relative loss of the same gas before and after enrichment under the special conditions of which he was speaking.

Mr. Sugg desired to add that what he wished to point out was that, with the flat-flame burner, they obtained different results according to the slit used. An Argand burner was a fixed thing, and could not be altered; whereas a finer or broader slit could be used with a flat-flame burner.

Mr. Lewis inquired if Professor Lewes could give the members some information as to the injection of oil into ordinary retorts during the latter end of the charge, as was practised by Mr. Herring, of Dover.

Mr. Perry F. Nursey said there was one point in connection with the paper which had not been touched upon; and that was the difficulty of obtaining hydrocarbon oils for the purposes for which they were required. This difficulty had occurred to him in numerous instances during the last 30 years, more particularly in connection with petroleum furnaces. It appeared to him that gas engineers were beginning the wrong end; and steps ought first to be taken for procuring the oil on reasonable terms, especially now that it had become to be of such great benefit. This reminded him of the old injunction in cookery-books to "catch your hare before you cook it."

Mr. Frank Mead observed that only one or two clauses of Professor Lewes's paper had been touched upon. Its real point was with regard to the gas that the author produced by his own apparatus. He showed that the gas was of much greater value than that made by the Lowe plant; and it was extremely important that the carbon monoxide was reduced by one-half. If it answered to enrich coal gas by gas produced by the Lowe system, surely it must answer better if they could obtain, on a commercial scale, such a gas as Professor Lewes made by his plant. He should like to see water gas standing on its own bottom, and the exact cost ascertained. So long as coal gas and water gas were worked in combination, it was impossible to find out the cost of the latter as compared with the former. With coal at a low price, of course water gas would stand a poor chance; but while coal was at its present figure, he thought it would have a good chance of competing with coal gas on commercial lines.

The President (Mr. W. A. Valon, of Ramsgate) said the discussion had been rigidly confined to the question of enriching ordinary coal gas; while he thought the object of Professor Lewes was to give them some idea of the apparatus which would produce quantity as well as quality, and this had been lost sight of in the discussion. As a practical gas maker, he could agree with the author that the time had come when they must try to have something else to rely upon than the present method of making gas in retorts. There were two months of the year when gas managers throughout the country were called upon to produce an extraordinary quantity of gas; and he thought that if they had, as a supplement to the manufacture of coal gas, an apparatus which would produce 25 or 18 candle gas at anything like 1s. 6d. or 1s. 8d. per 1000 cubic feet, they would be not

only justified, but would be called upon as engineers to take seriously into consideration whether the time had not arrived when that apparatus should be introduced into their works. In America, water gas was depended upon entirely for the lighting of some of the towns and villages; and in this country there was a strong discussion proceeding between the advocates of coal gas and of water gas as to which was the cheapest and the best. In America, water gas seemed to hold its own; but he did not believe it could compete with coal gas here. However, he did think that, in conjunction with coal gas, and used in the way he had indicated, water gas would be a great adjunct to the ordinary gas apparatus in this country, to be used as an enricher, and for quantity as well as quality when required.

Professor LEWES, in his reply upon the discussion, said that he was glad to find that one paragraph at least in his paper had been successful in creating a discussion; and, in replying to the remarks which had been made, he would first deal with those of Mr. Herring and Dr. Thorne. These gentlemen considered that his remarks upon the enriching value of mixtures of oil gas and oxygen were incorrect; and while Mr. Herring put this down to want of experience, Dr. Thorne considered that he (Professor Lewes) had been speaking *ex cathedrâ*. He would be very sorry for any member of the Society to think that he would place even one paragraph in the paper without having some justification for it; and he thought he could show that he was neither speaking without experience or without justification. He had experimented continuously with the enrichment properties of oil gas and oxygen for something like seven months; and although he found that, by mixing oil gas and oxygen, an increase in the illuminating value amounting sometimes to 25 per cent. could be obtained, yet, when this mixture was used for enriching poor coal gas, the enrichment obtained was not greater (and was often less) than when oil gas was used alone without oxygen. For some considerable time, these experiments gave results which were most inexplicable and unsatisfactory. Sometimes the enrichment figures appeared to bear out the idea of the oxy-oil gas being more valuable than oil gas alone; while just as often the figures obtained showed just the opposite. These contradictory results continued until the mixtures were made in a small holder, and every particle of the gas from the holder was burnt out at the photometer; the readings being taken continuously throughout, and then the mean of these readings taken as the value of the gas. It was then found that the enrichment value of the oxy-oil gas was generally lower than the enrichment value of the oil gas alone; and still further experiments showed that this was due to the cause which he had given in his paper, and that the contradictory results before obtained had been consequent on the practical impossibility of obtaining uniform mixtures in the holder, owing to stratification and layering of two gases of such totally different densities. The low temperature at which the oil had been retorted had been spoken of as being an important factor in the process. But he had a vivid recollection of a visit to Huddersfield, and of being shown the method by which the oil gas and the mixtures were made; and he had been surprised to find that the gentleman in charge of the plant insisted on the colour of the oil gas being chocolate brown, which every maker of oil gas knew denoted a high and not a low temperature. There was no doubt in his (the speaker's) mind, or in that of anyone else who knew anything of the properties of oil gas, that, when made at this temperature, it was one of the most permanent of illuminating gases, and, as Mr. Herring pointed out, certainly far more so than rich gas obtained from cannel coal. He (Professor Lewes) considered that, in the face of these experiments, he was perfectly justified in making the statement which he had made; and until these experiments had been disproved, he would continue to hold the same opinion as now. At the same time, his only desire was for scientific truth; and if Dr. Thorne would make an oil gas, accurately test its illuminating value, then mix it with oxygen, again take its value, and then enrich poor coal gas of known value with it, and after that show him, by properly conducted photometric experiments, that the amount of light obtained by burning the whole of the enriched gas gave enrichment figures nearer to those of the oxy-oil gas than of the oil gas alone, he would be pleased to embrace the view taken by that gentleman. But Dr. Thorne must remember that photometry was a subject in which the burners employed and the methods of testing had a most important effect, and that, in such experiments, an absolutely reliable standard such as the Dibdin 10-candle flame, must be used for burning throughout the whole of the experiments, while, in testing the gas, it should be burnt at a fixed height of flame, and the value calculated from the rate of flow. Mr. Herring gave them the figures for the working of this process for the past fortnight; and he (Professor Lewes) had roughly calculated the candles per gallon that these figures presented.

Mr. HERRING: I simply gave you the figures of the working, which I got out very hurriedly this morning.

Professor LEWES (continuing) said these figures came out almost exactly the same as the enrichment figures claimed for the Young process in the report made upon it by the Engineer of the Leith Gas-Works; and if this was so, the value of the admixture with oxygen did not in any way appear to be proved. In leaving this part of the subject, he must ask Dr. Thorne and Mr. Herring to pardon him if he believed in his own experiments rather than in theirs, and that they must also always remember that he was perfectly open to be convinced as to the error of his ways. He would now pass on to the remarks made by Mr. O'Connor, who pointed out that, with the improved working of the Lowe plant, they were obtaining results as high as 1300 candles, and that this was practically the same as was obtained by the carburetted hydrogen apparatus. There was no doubt that the result of 1300 candles was very good indeed; but Mr. O'Connor would, he believed, also be willing to admit that, in the early working of the Lowe process at Beckton, figures far below these were obtained, and that it was only by perfecting the plant, and using the most suitable grades of oil, that this result had been realized; while the figures he had given for the working of the carburetted hydrogen plant were obtained with an apparatus of small size, and endowed with almost every drawback that could be bestowed upon it. Even with this, he had reached figures far ahead of those given; and he hoped, with the new apparatus which would be working in a few days at the Old Kent Road, to show results better even than the best he had before obtained. It must be clearly understood, however, that he had no wish to underrate the Lowe process, which fully deserved the pre-eminence it had obtained in America, and the position it was now taking in this country; and, if he could improve upon the results obtained by it, he would feel that he had done very good work. With regard to the cost of the plant, he had taken the Lowe figures for the generator, cracking, and superheating chambers (as nearly as he could obtain them for this size of plant) from a paper by Messrs. Goulden and Paddon, read at the meeting of the Incorporated Institution of Gas Engineers in 1892; and he thought it must be manifest that the doing away with the big external superheating chambers with their checker-work of fire-brick must mean a great saving in construction. He wished to fully endorse the very valuable remarks which Mr. Lacey had made as to the testing of the stability of the gas; as the behaviour of an illuminating gas in a small holder, probably many times smaller in diameter than the mains through which the gas was passed in practice, gave them no indication as to what might be expected of that gas during distribution. He regretted that the lateness of the hour prevented him from discussing the extremely interesting table to which Mr. Lacey had referred, and which embodied the experiments made by the late Dr. Letheby upon a very large number of varying hydrocarbons and the illuminating power which definite weights of their vapour would impart to gas. Mr. Harris informed him that the Lowe gas had been made at the rate of a little under 1s. 8d. per 1000 cubic feet of 25-candle gas; and considering how soon this authoritative statement came after Mr. Methven's statement at the last meeting of the Incorporated Institution of Gas Engineers, and which was the one he had given in his paper, it must be admitted that they were making enormous strides at Beckton in the production of the gas. Mr. Sugg's remarks as to the importance of the burners to be used in gas testing, and the impossibility of getting flat-flame burners that could be relied upon for uniform results, would be fully corroborated by everyone who had studied the question. For experimental work, there was no doubt that flat flames could only be used with extreme caution, and great attention to the size of the slit or orifice. It was a well-known fact that flat-flame burners could be obtained in London which would develop nearly 3-candle power for each cubic foot of gas consumed; while they would not have to go far to find plenty of other burners which looked identical in construction, and yet did not develop 1-candle power of illuminating value for the same volume of gas consumed. These latter were largely employed because of their initial cheapness; being made in Germany at a low rate, and without any consideration of the value of the gas to be consumed in them. Mr. Lewis had asked as to the results to be obtained by injecting oil into the retorts at the end of the carbonization of the coal. There was no doubt but that this was an admirable device when the gas manager had no other means of enrichment at hand; but there was no doubt also that it was a very crude and expensive method of getting the illuminating value out of oil, and probably a large percentage was lost. Mr. Nursey had raised a most important question as to the price of the oil, and the probable rise which would take place if there were a large demand for it. He (Professor Lewes), however, thought that, in all probability, an increase in the demand would not cause an increase in the price; for, as soon as the demand was sufficiently large, pipe-lines would be laid from the Russian oil-fields to the ports, and the arrangements for shipping the oil largely augmented. Besides, it must be remembered that other oil-fields were being opened up, and that, as soon as oil seriously interfered with the use of cannel coal, attempts would be made to compete with it, and, by so doing, if possible prevent the gas manager from embarking in the stormy ocean of experiment. Moreover, shale oil and even certain forms of phenoloid oils would be thrown into the market at a sufficiently low rate to prevent any serious rise in the Russian oils. Mr. Frank Mead had pointed out the importance of reducing the quantity of carbon monoxide, and said that he would like to see carburetted water gas in a position to be distributed *per se* during (say) a portion of the summer months, when the gas manager wanted time for reconstruction and enlargement of his works. He (Professor Lewes) felt that, if he could succeed (as he had done) in reducing the carbon monoxide to one-half, they had attained a safe limit; but unless anthracite could be obtained at a cheap

rate at the works, it would never replace coal gas, as the coke was required as fuel for the generator. He also wished to emphasize the fact that there was no competition between enrichment processes such as the Young and Bell process and production processes such as the Lowe and his own, as the enrichment processes could at the most add some 6 per cent. to the volume of the gas, while the production processes could at a pinch make the whole of the gas required at the works—in this way proving of the utmost value to the gas manager when hampered by fog or labour troubles. In conclusion, he acknowledged a vote of thanks which the members had accorded to him for his paper.

Mr. HERRING said he would like to remark that he had been at Huddersfield for two years, and had never met Professor Lewes there.

Professor LEWES observed that the plant he had seen was a small experimental one in the house, he believed, of a Dr. Mackenzie; and that he certainly had not had the opportunity of seeing the plant which Mr. Herring had erected.

SOCIÉTÉ TECHNIQUE DU GAZ EN FRANCE.

The Papers Presented at the Annual Congress.

In the JOURNAL for the 5th ult., we noticed some of the papers presented at the congress of the above Society recently held in Paris. We now deal briefly with the remainder.

In a short communication by M. Faure, he showed how a telescopic gasholder might furnish a very simple means of preventing extinction of the lights at the burners supplied from the mains served by it, in the event of a mishap in the action of the outlet-valve, provided that the inner lift gave a lower pressure than any of the other holders, and that the pressure furnished by the two lifts together was higher. When these conditions are fulfilled, all that is needed is to keep the telescopic holder in constant connection with the outlet-main, in order to avoid all chance of extinction. There is no necessity to make a fixture the lift which is to act as the anti-extinguisher. When the exigencies of storeage require the lift to be emptied, a time has to be chosen when the manipulation of the valves would not cause any complication, and when the consequences of an extinction would be the least feared. M. Faure's system has therefore one disadvantage; and it was brought into prominence, in the discussion, by M. Coindet, who reminded the members that there was a more simple plan—viz., the use of his automatic appliance which restores the supply of gas between the works and the town in the event of a wrong movement of the valve. M. Godinet said he thought M. Faure's system would be inconvenient from the fact that it reduced to a minimum the capacity of the telescopic holder.

In a note on gasholders with metal tanks, M. Godinet laid down the conditions under which tanks so constructed are to be preferred to those of masonry, notwithstanding certain inconveniences attaching to them—viz., action of the wind upon the bell, lowering of the temperature of the tank water in winter, and liability of the material to deteriorate quickly. He explained why, in the construction of a metal tank, sheet iron should be employed in place of either cast iron or sheet steel, although in the case of large tanks it is almost impossible to use the first-named material. The author showed, by calculation, that for a tank 56 metres (184 feet) in diameter and 14·4 metres (48 feet) high, sheets of metal 2 inches thick would be required, whereas, in practice, sheets only about half this thickness should not be used, as they could not be punched. The new arrangement M. Godinet laid before the members, which allowed of large tanks being constructed with plates of moderate thickness, consists in the employment of two or more concentric tanks connected by angle-irons with water-tight rivetings. The inner tank is of the required capacity; and the others are successively lower in proportion to their distance from the centre. The spaces between the several tanks are, like the tank itself, filled with water. By arranging the level of the water in the outer tank at a suitable height, the sides of the central tank may be constructed of sheets of moderate thickness. The economy of the system consists solely in the use of sheets of metal of practical thickness, such as are usually made, as these can be easily punched, bent, placed in position, and riveted; and the author claimed that by it an iron tank could be put up in cases where the cost by the ordinary method would be prohibitive. Of course, the arrangement is only applicable to tanks of large size. In the discussion upon the paper, M. Mallet remarked that a very serious accident had occurred at the Versailles Gas-Works owing to the use of a cast-iron tank; and several objections were raised to them. First of all, there was the liability to corrosion; then there was the excessive thickness of metal required, and the consequent additional expense; and, lastly, the difficulty of placing the tank upon the ground. With regard to the first objection, there was nothing to fear. As to the second, it resulted from an incorrect application of standard formulæ. Gasholder tanks were not, like artistic work, subject to the action of external agents; and therefore it would be perfectly safe to use in their construction plates which, under ordinary calculation, would be rejected as too thin. With respect to the third objection, he said the simplest method of putting the tank upon the ground was to spread upon the soil, after it had been levelled, a layer of asphalte; and, when the tank was placed in position, to fill it with water into which steam had been injected. The heat thus generated would soften the asphalte; and the tank would then descend into it by its own weight, and make for itself a permanent bed—the bottom being at the same time protected against corrosion.

The automatic regulation of pressure in mains was dealt with by M. Coindet. At the congress of the Society in 1891, he introduced an apparatus for this purpose which required special batteries and a rather complicated system of working. He now submitted a model of a modification of the arrangement, in which the special batteries were dispensed with, and all the mechanism was enclosed in two small boxes protected from the accidents to which the original apparatus was exposed. In a paper read by M. Alavoine at the congress in 1879, he showed that, by means of M. Giroud's appliances, he was able to so regulate the pressure in the mains at Beauvais that he could increase the quantity of gas passing out of the works from 350 to 570 cubic metres per hour with an initial pressure of about 10 mm. It was claimed that the same advantage could be realized by M. Coindet's system with a low first cost, which could be put at from 1200 frs. to 1500 frs. per regulator, according to the length of line, and with an expense of about 50 frs. per annum for maintenance.

M. Jouanne described a system of distillation whereby the yield and quality of coal gas could be increased, with the simultaneous production of carburetted water gas. His communication formed a continuation of the paper he presented at the congress last year. The object he had in view, in the trials of which he gave an account, was to place in the hands of gas managers a practical means of increasing the production and illuminating power of gas as desired, according to daily requirements and to the quality of coal employed. The experiments were of two kinds. The first were in connection with a new method of producing carburetted water gas, consisting in the direct injection into a mass of bituminous schist, under distillation, a current of steam, which decomposes in contact with the mass just as it does in contact with coke or anthracite in the manufacture of low-quality gas. According to the author, the characteristic advantage of his process is that by carrying on simultaneously, in the same retort, the distillation of bituminous schist and the decomposition of steam, the water gas, which is generated in the presence of rich gases and hydrocarbon vapours, combines with them, and is enriched to the desired degree. The manufacturing process is carried on in cast-iron inclined retorts if it is to be intermittent, but in clay retorts if continuous. The arrangement comprises the superheating vaporizer described in the author's previous communication, and a special injector, resting on the bottom of each retort, distributing, by means of lateral openings along its length, superheated steam into the midst of the mass of material. The results of the first trials led M. Jouanne to make others and apply the same process to ordinary gas-retorts. The arrangement, which has been patented, consists in injecting steam into the retorts without effecting any important change in the construction of the ovens; thus producing carburetted water gas as readily from a charge of common coal as from a mass of Boghead or cannel coal in course of distillation. The process has not, we believe, been tried on a commercial scale; and M. Jouanne intends presenting to the Society a further communication on the subject.

The next paper dealt with a chemical question. In it MM. Frère and Mesla described a new method for the recovery of ammonia from spent purifying material. They first of all extract the sulphur, and then convert into ammonia all the nitrogen of the cyanides, ferrocyanides, and sulphocyanides remaining in the mass. The former operation is effected by means of bisulphide of carbon in the ordinary way. Their method of transforming cyanic acid into ammonia is based upon the action of steam upon the cyanides. The latter is decomposed on being heated in a current of the former; and all the nitrogen is liberated in the form of ammonia—carbonic oxide and carbonic acid being at the same time formed. This action of the water only upon the material does not give satisfactory results; and a portion of the nitrogen disappears. In order to avoid this loss, the authors have had recourse to treatment by lime before applying the steam; and in this way they have succeeded in modifying the various reactions. Under these conditions, the different ammoniacal salts—the sulphates, cyanides, ferrocyanides, and sulphocyanides—are transformed into calcic salts simultaneously with the liberation of ammonia; and each of these salts is easily decomposed by steam, with the formation of ammonia. The hydrocyanic acid resulting from the decomposition of the ferrocyanides also finds itself in the presence of an excess of lime, and is subjected to the same ammoniacal transformation. The operations, therefore, consist simply in mixing the purifying material with milk of lime, and submitting the product, in a retort, to the action of steam. The vapours, mixed with ammoniacal gas, are led into a column, which enables concentrated liquors or alkali to be obtained direct. It is claimed that the treatment of the material by this process would yield more profit than its sale direct.

A note on the employment of a Charon gas-engine for the production of the electric light was presented by M. Breittmayer. The author gave figures based on results obtained in

trials of two types of engine—one of 4-horse and the other of 25-horse power. MM. Witz and Chauveau separately found that the consumption of gas in the former motor was 600 litres (21 cubic feet) per effective horse power per hour, working under normal conditions. At La Rochelle, a committee composed of state and municipal engineers certified that the consumption in the 25-horse power engine was 492 litres (17·3 cubic feet) of gas per effective horse power per hour. M. Breittmayer took for his calculations 600 litres for the small, and 500 litres for the large engine; and he ascertained therefrom the net cost of a lamp-hour of 10 candles and that of a hectowatt-hour for electric lighting installations established by the aid of gas-engines of the above-named type. He came to the conclusion that, under the most unfavourable conditions, it will be advantageous to produce the light with the assistance of gas-engines, that the hectowatt-hour will cost only 11·7c. for 60 lamps, and will go down to 7·3c. for 375 lamps, while for a similar number of lights served from a district supply the price for this unit would, on an average, be 15c. and 13c. Where the expenses of special premises have not to be included, nor those of a staff occupied exclusively with the installation, these figures will be reduced to 7·7c. and 5·8c.; and to 4·9c. and 4c. after the first outlay upon the plant has been reimbursed—the rent and payment to the staff not being allowed to burden the working expenses in this case.

The other matters which came before the members do not call for extended notice. M. Delahaye gave some further particulars of gas and electric lighting in Massachusetts—a matter which formed the subject of an article in the JOURNAL for the 26th ult. M. Giroud described a regulator for equalizing pressure in high and low level mains; M. Bouisson, in a paper accompanied by drawings, explained a moveable crane devised by him for pipe-laying work; and M. Jouanne showed how gas can be applied to public water stand-pipes or hydrants to prevent them from freezing. A direct-lighting high-power gas-lamp was introduced by M. Hubert; a cylindrical burner, with double chimney and regenerator, by M. Delafollie; and a magnetic water-level indicator for meters, by M. Sar.

Resignation of the Chairman of the Nottingham Corporation Water Committee.—On the 26th ult., Alderman Gripper addressed a letter to the Mayor of Nottingham (Mr. A. Brownsword) in which he tendered his resignation of the chairmanship of the Corporation Water Committee, in consequence of the "proceedings" of that body on the previous evening. The nature of these proceedings has not yet been divulged; but, in his letter, Alderman Gripper remarked that it seemed to him "the course taken tends seriously to lower the standard of right and wrong in public work, and to make equal justice to all ranks of employees impossible."

Electric v. Oil Lighting of Trains.—In the course of a series of articles in *L'Electricité* on the above subject, the following figures are given as a comparison between the cost of oil-lamps and electric lights. The system under discussion is that of accumulators carried in the train, and supplied at fixed charging-stations. The total expense of an electric lamp in a first-class carriage, including interest on capital, &c., comes out 0·0289 fr. per lamp-hour; while an oil-lamp (of only 7-candle power) costs 0·38 fr. per hour. In the second and third class carriages, where more lamps are run off the same battery, the comparison is still more in favour of the electric system.

Books Received.—Transactions of the Society of Engineers for last year, with General Index from 1861 to 1892. The volume is edited by the Secretary (Mr. G. A. Pryce Cuxson), and published by Messrs. E. and F. N. Spon.——"Plumbing, Drainage, Water Supply, and Hot-Water Fitting," by J. Smeaton, Examiner to the Worshipful Company of Plumbers. The publishers are Messrs. E. and F. N. Spon.——The *Liberty Review*, a quarterly magazine devoted to the defence of freedom and of the right of property. Among the articles is one on "The Conflicts of Capital and Labour in Germany," by H. A. Bueck; and another on "How to Remedy the Evils of Local Government," by E. L. Sellon. The magazine is edited by Mr. F. Millar, and published by Messrs. Watts and Co., Johnson's Court, E.C. It is intended to convert the magazine into a weekly publication early in December.

American Gaslight Association.—The twenty-first annual meeting of this Association is to be held in Chicago, commencing on the 18th inst., under the presidency of Mr. A. E. Boardman. We learn from the official notice issued by the Secretary (Mr. A. B. Slater, jun.) that four papers have been already promised. They are as follows: "Purification by Iron Oxide," by Mr. G. T. Thompson, of St. Louis; "Gas-Engines in the United States," by Mr. F. H. Shelton, of Philadelphia; "Rate of Purification," by Mr. J. A. P. Crisfield, of Savannah; and "The Relation of Temperature to Purification," by Mr. Jas. Somerville, of Indianapolis. There may possibly be two other communications. This year the questions submitted for the "Question-box" are to be printed and sent out with the papers. The meeting being held in the city to which so many visitors have directed their steps during the past few months, there will no doubt be a full attendance. With a good technical programme and the attractions of the World's Fair, the "coming of age" gathering of the Association should prove one of the most enjoyable the members have had.

REGISTER OF PATENTS.

Compound Gas-Engines.—Hartley, J. W., and Kerr, J., of Kilmarnock. No. 17,427; Sept. 30, 1892.

This invention relates to compound gas-engines; and its object is to provide means of igniting hot gases passing from the high-pressure to the low-pressure cylinder with a minimum loss of heat; and also to provide a valve arrangement communicating with an igniter-tube, of such a nature as to render premature ignitions from leakage an impossibility. It is intended to ignite the compressed explosive mixture after the crank has passed the centre, instead of on the centre as is usual; and at the same time to compress the products of combustion in the second cylinder and passages leading thereto.

Valve-Actuating Gear for Water-Gas Plant.—Glasgow, A. G., of Westminster Chambers, S.W. No. 19,753; Nov. 2, 1892.

This invention relating to water-gas apparatus is intended to provide means whereby the position of the gas-outlet from the generator and of the steam admission to the generator can be simultaneously adjusted as required, by the turning of a single handle.

It is desirable, the patentee remarks, to periodically reverse the direction in which the steam passes through the fuel bed in the generator; and at each such reversal it is necessary, of course, to change the outlet for the gas. For this purpose, two valve-controlled outlets are provided for the gas at opposite ends (or top and bottom) of the generator. According to one part of the invention, the opening of one gas outlet-valve and the closing of the other simultaneously is done by the movement of a common handle, and so that both shall not be closed nor fully open at the same time—that is to say, valves of the rack-and-pinion type are used, and mounted on the pinion shaft are more sprocket wheels, connected by means of a chain so arranged that one valve cannot be moved independently of the other. The valves are set initially so that, when one is closed, the other is open. Consequently it follows that this arrangement, besides ensuring the opening and closing of the valves simultaneously, affords the further advantage that the valves counterbalance each other, and therefore work far more easily than a single valve. An exact equipoise may be secured, if desired. If the two valves are not of the same diameter, and consequently have not the same travel, the sprocket wheels are constructed of different sizes, so as to gear up or down as required, to ensure that they shall perform their full traverse in the same time.

For simultaneously reversing the direction of the steam with the changing of the gas-outlet, a three-way cock or a pair of cocks or valves is provided in the steam-pipes leading to the generator, by means of which the steam can be turned into the top or bottom of it. The levers for controlling the cocks or valves are operated by the movement of the valves in such manner that, when a change is made in the opening of the valves, the steam cocks or valves are also at the same time reversed, so as to cause the steam to be delivered to the opposite end of the generator.

The use of such an arrangement would enable a single attendant to easily adjust the weighty valves required in water-gas making, and would further serve to relieve him of all responsibility of preserving the proper relative positions of the several valves, thereby preventing danger or loss of gas, which would result from the improper manipulation of the valves.

Obtaining Ammonia, Chlorine, and Hydrochloric Acid from Ammonium Chloride.—Mond, L., of Northwich. No. 19,812; Nov. 3, 1892.

In previous patents—Nos. 66, 1049, and 3238 of 1886, No. 10,955 of 1887, and No. 2575 of 1889—the present inventor described processes for obtaining ammonia and chlorine from ammonium chloride, by treatment, at a suitable temperature, of certain oxides or salts by ammonium chloride (by preference, previously vaporized), which gives rise to the formation of fixed chlorides and oxy-chlorides, and liberates ammonia gas and vapour of water; and subsequently the treatment with air of the fixed chlorides or oxy-chlorides so obtained, at a more elevated temperature than the one employed during the previous operation, whereby chlorine gas is obtained, and the oxide or salt originally employed is regenerated. In order to avoid loss of ammonia, and to more easily effect the change of temperature required, the chlorides or oxy-chlorides formed in the first operation are subjected to a current of hot inert gas before the treatment with air commences. The ammonia gas obtained in the first operation sometimes contains a small quantity of chloride of ammonium vapour, which is apt to block the conduits through which the gas passes. It is therefore proposed to place a washer, or series of washers, in close proximity to the apparatus in which the ammonia gas is evolved, and connected to it by a pipe covered with non-conducting material, so as to avoid condensation of chloride of ammonium in this short pipe; and to treat the ammonia gas in this washer with hot milk of lime, which condenses and completely decomposes the chloride of ammonium vapour—forming calcium chloride and liberating ammonia, without absorbing any quantity of the latter. As an alternative, the gas in this washer may be treated with very hot water, or an unsaturated solution of ammonium chloride, which absorbs the ammonium chloride vapour and only very little caustic ammonia. Using the same hot water or unsaturated solution of ammonium chloride over and over again, it is possible to obtain gradually a concentrated hot solution of ammonium chloride, from which this substance can be obtained in the solid form by cooling and crystallization. The washer, or series of washers, used for this purpose (which may be of any convenient shape), are constructed of cast iron; and the milk of lime or other absorbent is distributed in it in the form of a spray, as is well understood.

The inert gas mentioned above also contains, besides ammonia, some ammonium chloride vapour; and at a later stage it contains a small quantity of hydrochloric acid gas. To remove these, the inert gas is passed through the same washer or washers as serve for washing the ammonia gas; and it is there washed with hot milk of lime, with hot water, or with a hot unconcentrated solution of chloride containing a little ammonia. This removes the bulk of the ammonium chloride,

and also the hydrochloric acid; and on being passed through another washer, or series of washers, the caustic ammonia is absorbed by means of cold water or brine. On leaving these, the inert gas still contains a small quantity of ammonium chloride in an extremely fine state of division; and in order to recover this, the gas is passed through a layer of cotton wool or other fibrous material possessing the quality of filtering very fine solid particles out of a gas.

Mantles or Filaments for Incandescent Gas-Lamps.—Boult, A. J.; communicated from O. H. Steuer, of Dresden. No. 13,066; July 4, 1893.

Alluding to his proposal for producing incandescent mantles for gas-lamps of the Welsbach type, the patentee says: "The incandescent mantles hitherto in use for incandescent gas-lamps have the great disadvantage of being not only extremely fragile, but are also unable to adapt themselves to the variation in the pressure of the gas. The various means suggested in order to overcome these defects have all failed, inasmuch as they usually interfered with the power of incandescence. It has also been tried to produce a support or core for the illuminating minerals or metallic salts, so as to give the latter more durability without reducing their lighting power. These experiments have all been a failure, because the metallic oxides could not be made to adhere firmly to the core, and invariably scaled off under the action of the heat."

By means of the present invention, however, it is intended to overcome these difficulties by providing the incandescent material—*i.e.*, the minerals or metallic salts—with a skeleton (so to speak) capable of intermixing intimately and firmly with the salts. This is done by employing gold or platinum (or a mixture of both) in the form of dust, which has been precipitated from a solution containing a suitable acid. The precipitated matter appears in the form of a spongy, porous mass of finely-divided metal, in which form it is especially adapted to mix with and retain the incandescent materials. The mixture may then be applied to a core or support, which need not necessarily be made of incombustible material; or it may simply be mixed with a suitable binding medium into a stiff paste, so as to be moulded into proper shape.

It is well known that a solution containing gold or platinum becomes decomposed under the influence of moderately applied heat. In soaking a fabric or other absorbing material—such as paper, wood, &c.—with a solution containing gold or platinum or both, the metal will be found to deposit in a minutely divided but coherent state upon the material, forming thereon a very fine fibrous structure of proportionately great strength and elasticity, to serve as a solid core for the incandescent mantle. The core is now impregnated with light-producing bodies—such as oxide of calcium (quicklime) or oxide of strontium—so as to produce an incandescent mantle possessing great elasticity and tenacity, together with a tendency to adapt itself to the flame, inasmuch as it increases or reduces slightly in volume according to the variations in pressure of the gas. This feature is said to form a very important point, in view of the fact that the pressure of the gas can never be regulated very exactly.

Gas-Lights for Temporary Use and Signalling Purposes.—Girardin, G. J., of Berlin. No. 13,742; July 15, 1893.

This invention relates to an apparatus for automatically lighting by gas halls, vestibules, stairs, and similar places needing light at night for a short time only. The apparatus is operated by the opening and closing of the house-door in such a manner, that, on opening the door, a certain quantity of gas is sucked into a cylinder, and is afterwards, on closing the door, pressed into a reservoir, from which the gas feeds the flame until it is consumed. A small gas-flame is kept burning continually; and this flame is increased by the gas of the reservoir, so as to afford a sufficiently strong light for a certain time.

Starting Apparatus for Gas-Engines.—Bickerton, H. N., of Ashton-under-Lyne. No. 14,454; July 27, 1893.

For the ignition of gas-engines according to this invention, the patentee proposes to employ a separate or extra cylinder or chamber, provided with a firing or ignition valve, and a valve for the escape of superfluous air or spent gases. The cylinder or chamber is also connected with the main cylinder of the engine; and the communication is capable of being closed or opened by a special intermediate valve, operated by a lever, which (according to its position) keeps the valve open or closed, or enables it to act as a back-pressure valve. The lever actuating the air and gas valves of the engine carries a moveable bowl, which, in the working of the engine, acts upon a single cam upon the side shaft; but, for purposes of starting, this bowl is, by a slight side movement, brought into contact with two cams, instead of one, whereby the air and gas valves may be opened twice the number of times in a given period. The bowl on the exhaust lever is also capable of being moved out of action entirely during the operation of starting.

The action of the starting apparatus is as follows: The fly-wheel of the engine being turned, air and gas are drawn into the engine cylinder by the forward stroke of the piston; and the backward stroke drives the explosive mixture through the intermediate valve (the exhaust being closed), which is kept open by its lever for this purpose. The mixture passes through the communicating pipe to the extra cylinder or chamber, from which any spent gases are thus driven out by way of the outlet-valve—a clack valve opening outwards, and which is firmly closed before an explosion is allowed to take place.

This operation of charging, by causing the engine to act as a pump, is repeated a sufficient number of times (till the desired quantity of explosive mixture is collected within the chamber), either by turning the fly-wheel by hand, as in the case of first starting a new engine, or by utilizing the momentum of the fly-wheel as the engine is coming to rest, whereby the engine is made ready for starting whenever required. The cam bowls are then replaced for working; and the intermediate valve-lever is moved over, so that the valve acts solely as a back-pressure valve.

Ignition within the separate cylinder or chamber is then caused to take place; and the force of the exploded mixture passes therefrom into the cylinder of the engine, where it is retained by the intermediate valve, to act upon the piston.

APPLICATIONS FOR LETTERS PATENT.

17,530.—Kirmsse, C. E., "Raising water." Sept. 18.
17,560.—Round, A., "Protectors for gas-burners." Sept. 18.
17,563.—Boult, A. J., "Heating and ventilating stoves." A communication from G. Dubuisson. Sept. 18.
17,587.—Wright, F., "Prepayment gas-meters." Sept. 19.
17,655.—Kershaw, P. B. W., and Tottenham, B. L., "Motors driven by explosive force or gaseous fluid at high temperature." Sept. 19.
17,729.—Kelvie, A., "Convertible combination lamp for electric light, gas, oil, or candle fittings for general advertising." Sept. 20.
17,811.—Mansfield, E., "Manufacture of gas." Sept. 22.
17,856.—Stocker, G. L., "Filtering water." Sept. 22.
17,860.—Whitham, F. W., "Gas or vapour engines." Sept. 22.
17,881.—Slinn, W. H., "Gas and other engines." Sept. 23.
17,919.—Branston, F. R. E., "Stoves for oil or gas." Sept. 23.
17,929.—Adams, C. H. and C. H. H., "Taps and fittings for water supply." Sept. 23.
17,987.—Robinson, M. H., "Gas and oil engines." Sept. 25.
18,017.—Crossley, F. W., Atkinson, J., and Bradley, H. W., "Gas or internal combustion engines." Sept. 26.
18,152.—Vaughan-Sherrin, J., and Garner, C. N., "Cylinders and pistons for gas and other heat engines." Sept. 27.
18,180.—Shields, W. D., and Gibson, G. H., "Water Motors." Sept. 28.
18,194.—Beilby, G. T., "Manufacture of ammonia and other products." Sept. 28.
18,266.—Edwards, B. J., "Gas and like engines." Sept. 29.
18,314.—Hatcher, F., and Challis, E., "Gas or oil stoves." Sept. 29.
18,329.—Towlson, J. T., "Rotary pumps applicable as pressure blowers and exhausters." Sept. 30.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

The Tatham Process at Huddersfield.

Sir,—Although, as I mentioned in the discussion on Professor V. B. Lewes's paper, read before the Society of Engineers on Monday last, I hope very shortly to lay before gas experts full particulars of the recent experimental and practical results obtained with Tatham's oxy-oil gas, there are so many incorrect and misleading statements in your article on "The Tatham Process at Huddersfield," in this week's issue of the Journal, that I cannot leave it entirely unnoticed.

In the first place, the Tatham gas was *never* put forward merely as a competitor with Pintsch gas, or for railway lighting only. In my communication to The Gas Institute in 1890, to which you refer, absolutely no reference to Pintsch gas or railway lighting was made—comparison being solely with coal gas; and the use of oxy-oil gas for enriching purposes was specifically mentioned. Thus no *new* claims have been put forward on behalf of oxy-oil gas.

With your allegations against Mr. Herring, I can safely leave that gentleman to deal; though, far from his taking only cannel enrichment into account, I believe he visited Peebles, and carefully investigated the Young process, before recommending the oxy-oil gas process to his Corporation.

In working out your enrichment figures for comparison with the Young-Bell process, you obtain results differing much from what I calculate. The figures definitely given you, on behalf of Mr. Herring, on your visit to Huddersfield, as the results of the use of the first 100,000 cubic feet of oxy-oil gas made, were that, with a gas output containing 6·7 per cent. of oxy-oil gas, the increase of illuminating effect was from an 18 to a 24 candle gas. I make this result (with solar oil of ·870 sp. gr.) to show an enriching effect of the oil gas of about 107·5 candles per 5 cubic feet, or a duty of nearly 1900 candles (1892) per gallon of oil, as compared with your figures of 100 and 1700 candles respectively. It is also hardly fair, it seems to me, to compare the results obtained with the first 100,000 cubic feet of gas made from a new installation (where waste of oil and gas and inefficient working, &c., are inevitable) with those obtained under the most favourable conditions with a plant in full work.

With regard to the difference of opinion between Professor Lewes and myself, my *obiter dictum* was based on at least as full experimental data as his Cantor Lecture utterance. Our views are apparently diametrically opposed on this point, of the comparative enriching power of oxy-oil gas and simple oil gas. I am confident of my own opinion, as based on my own work; and I can only explain our discrepancy by the different modes of work. I dealt with Tatham's oxy-oil gas—*i.e.*, with a gas made by the addition of oxygen to *warm* and very heavy oil gas soon after it left the retort. In this way some hydrocarbons are retained in the gaseous condition, by the peculiar carrying power of the oxygen, which would undoubtedly be deposited (and lost) from the plain oil gas by the time it thoroughly cooled and could be tested. Thus the oxy-oil gas is something more than a mere mixture of cold and comparatively stable oil gas with oxygen. The proportion of oxygen added when the gas is to be used for enrichment is rather less than that found to give the best results for burning *per se*. If Professor Lewes experimented with fully-cooled oil-gas of (say) 60 to 70 candle power, and added oxygen sufficient to give the most favourable results in burning *per se*, I can well understand his results being unfavourable to *so-called* oxy-oil gas for enrichment. I am quite prepared to stand by my *obiter dictum*.

Lastly, with regard to the question of cost of oxy-oil gas and enrichment therewith. The only estimate of cost of this gas mentioned in your whole article is one of 7s. 6d. put forward by yourself; but on

what it is based I am at a loss to understand. In my paper and report which you have quoted, I have put the cost of oxy-oil gas at 3s. 6d. to 4s. per 1000 cubic feet; and this is, I believe, a fair figure at present prices of oil, but one probably capable of reduction when a sufficient demand has brought about arrangements for the introduction of cheaper oils, and also when working on a very large scale. In this estimate, the cost of oxygen *is* included, and is taken at 4s. per 1000 cubic feet, including wear and tear of, and interest on, plant and the special reduced royalties payable under the agreements between the Hydro-Oxy and Brin Companies. For a plant of the size of the Huddersfield one, this is certainly a fair figure, and in larger ones will probably be reduced.

Further points, I must leave till my full paper.

LEONARD T. THORNE,

69, *Horseferry Road, Westminster, S.W.*, *Oct.* 5, 1893.

SIR,—With reference to the article on the above subject in the last issue of the JOURNAL, I regret to say that the same gives anything but a fair and just view of the process or the present circumstances connected with it.

In the first place, the Huddersfield Corporation had arranged to put down plant for the manufacture of oxy-oil gas under the Tatham patents, and agreements were drawn up between them and the Northern Counties Hydro-Oxygen Gas Company, previous to my taking charge of these works early in 1892. Therefore your inference —"so seems to have reasoned Mr. W. R. Herring, of the Huddersfield gas-works," &c., &c., inferring, as I read it, that the results of the experimental work mentioned in the last paragraph of the second column of page 623 induced me to advise my Corporation to adopt the process—is without foundation. But, as a matter of fact, an Engineer was never more comfortably placed than myself—simply having to develop a new process of very considerable promise, without being in the leastwise responsible for its adoption.

The remark respecting the date of my experiments being the same as Professor Lewes's Cantor Lecture, and the reference to the Committee's absence from such, are altogether beside the question, but denote an undercurrent of feeling which is not conducive to impartiality.

With regard to the figures, &c., upon which the arguments are based, when these were given, it was distinctly stated that they were the results of the first run with the new plant; and it is manifestly unfair to compare these with a process that has been working for nearly twelve months. Since, however, the writer prefers such, it may probably turn out to be to the serious detriment of the Young and Bell process. The bare facts of the case are as stated in my remarks before the Society of Engineers, at their meeting on the 2nd inst. We had then run our plant for a fortnight; and a gas containing 5·96 of oxy-oil gas was increased in illuminating power from 18 up to 23½ candles. Does the process advocated do as much?

In my opinion, a process that yields upwards of 25 per cent. of solid residue from each ton of oil used must, on the face of it, be extravagant and expensive to work. The Young and Bell process yields upwards of 25 per cent. of solid residue; the oxy-oil process, under 5 per cent. of solid residue.

I am quite prepared to stand by my own statements, already made, as to the success of the Tatham process; and I only regret that time has not permitted me to give more elaborate statements as to the process in general. This, however, will soon be forthcoming from more able hands than mine.

W. R. HERRING, Engineer and Manager.

Huddersfield Corporation Gas-Works, Oct. 7, 1893.

SIR,—In your article on "The Tatham Process at Huddersfield" in the last JOURNAL, I notice that the cost of oxygen is referred to as being, "to say the least of it, undefined with the accuracy to be desired." The cost of oxygen made by the Brin process has more than once been mentioned in the JOURNAL; and, in your issue of the 16th of May this year, you publish a paper entitled "Notes on the Application of Oxygen to Lime Purification at Shrewsbury," which was read by Mr. Belton at the annual meeting of the Incorporated Institution of Gas Engineers. In this paper, after three years' experience with the Brin process, Mr. Belton writes as follows: "So far the average cost of producing the year's supply, including wear and tear, and all actual working expenses, but excluding interest on capital and royalty, has been 3s. 6d. per 1000 cubic feet of oxygen—the quantity being about a million cubic feet per annum; and the royalty adds 1s. per 1000 feet upon our small production. These figures should, however, be reduced with larger plants, as their first cost is proportionately less; and some advantage may be gained in their working, and by commutation of the royalty."

The opinion of Mr. Belton, as that of a totally unbiassed authority, must be of more value than mine. I may say, however, that the oxygen plant erected by the Brin Company at Huddersfield is six times the size of the one on the working of which Mr. Belton has based his figures; and that, adding interest on capital outlay and the special royalty arranged between the Brin Company and the Hydro-Oxy Gas Patents Company to the other charges mentioned by Mr. Belton, I calculate that the cost of oxygen at Huddersfield, when the plant is working to its full efficiency, will be 4s. per 1000 cubic feet.

KENNETH S. MURRAY,
Manager, Brin's Oxygen Company, Limited.

69, *Horseferry Road, Westminster, S.W., Oct.* 6, 1893.

[With regard to the article commented upon in the foregoing letters, it is only necessary to state, by way of reply to the principal points brought forward by our correspondents, that our sole purpose in writing it was to pick up the thread of the development of the Tatham process from where it was dropped more than three years ago, to be placed again in our hands at Huddersfield. The article is confessedly inconclusive respecting the merits of the system; and we have nothing to add to our observations pending the appearance of that full and detailed report upon the results of working the perfected Huddersfield plant promised to be sent to us by Dr. Thorne. This shall receive all possible publicity and consideration in the JOURNAL. Meanwhile, we would desire our esteemed correspondents to preserve an equilibrium of temper in any further observations they may find it necessary to offer on this subject—remembering that imputations of "feeling" to critics are apt to miscarry. Mr. Herring seems at last to have become aware of the fact that the comparison of the Tatham process is with that of Young and Bell; and to his query respecting the performance of the latter process, there are plenty of interested witnesses well able to reply. Dr. Thorne must pardon us for differing from his view of the position essayed to be occupied by the Tatham process in 1890. Perusal of Dr. Thorne's own Gas Institute paper on the subject, which appears as an appendix to the Transactions for 1890, bears the title "Experiments on Oxygenated Oil Gas (Tatham's Process) as an Illuminant;" and it begins by setting out "Tatham's proposal" as being "to store mixtures of hydrocarbon and oxygen gases containing considerable proportions (up to, say, 30 per cent.) of oxygen, and to distribute and burn these mixtures in the same way as is now done with ordinary coal gas." No attempt was made at the time to demonstrate the advantage of oxy-oil gas for carburetting; and although Dr. Thorne certainly did mention, in three lines at the end of his paper, such a use for this mixture, the reference was prefaced by an "also," and there the matter rested for three years and more. Our comparison of Tatham gas to Pintsch gas was perfectly proper at the time, and was never complained of. We hold, upon these facts, that our description of the Tatham process, as emerging from three years' further incubation in a fresh guise with "a claim to *superiority* as affording a means of enriching common coal gas," is quite justifiable. The whole point is in the word italicized, which Dr. Thorne ignores, but which is precisely what the partisans of the Tatham process have to deal with. Here again the controversy lies between Dr. Thorne and Professor V. B. Lewes, Messrs. Young and Bell, Linton, Mitchell, Sheard, and others. We never meant to pin the future of the Tatham process to any figures, definite or otherwise, given to us at Huddersfield. As a matter of fact, the figures so given were anything but definite; but seeing that no opportunity existed for checking a single datum, we gave the result for what it might be worth. The correction offered by Dr. Thorne is only a question of a small fraction of oil used, more or less, or of gas made; and as all the information on this point vouchsafed to us at the time was verbal, it is quite possible that our notes were to this extent inaccurate. The whole of the plant, moreover, was admittedly imperfect—no reliable information respecting the cost of anything was procurable; and this must also be our explanation to Mr. Kenneth S. Murray, for leaving the charge for oxygen in blank for the occasion. It is for Dr. Thorne to set all these points right in his promised report.—ED. J.G.L.]

"Penny-in-the-Slot" Gas-Fires.

SIR,—The suggestion made in your issue of the 19th ult., and again referred to by Mr. T. Fletcher in the last number, has been on trial in one of our Liverpool hotels for twelve months, and has been so successful that we have received an order to fit the bedrooms of the hotel throughout. One of the Automatic Gas-Meter Company's meters is fixed on the mantelpiece in the bedroom, and an atmospheric gas-fire is placed in the fire-grate. The occupant of the bedroom can then have a fire whenever, and for what length of time, he wishes, by placing in the meter a number of pennies equal to the number of hours he wants to have the fire burning. The cost of this arrangement complete is about £4 per fireplace, including cost of meter, stove, and fitting.

JOHN HAYNES, Manager and Secretary,
Oct. 4, 1893. Liverpool Gas-Fittings Company, Limited.

Gas Consumption at Stockport.—A question was put at the meeting of the Stockport Town Council last week, as to the cause of a reduced consumption of gas recently, as compared with the corresponding period of last year. Mr. J. Noden, the Chairman of the Gas Committee, explained that the diminution arose from causes over which the Committee had no control. It was due in part to the unusual fineness of the weather; while the destruction of two local mills by fire accounted for a decreased consumption of 800,000 cubic feet in the six months. It was, however, a fact that since the 1st of January the consumption had increased by more than 2 million cubic feet as compared with last year.

The Agitation against the Rothwell Gas Company.—With respect to the reported extraordinary demonstration against the Rothwell Gas Company to which references have been made in our last two issues, the Chairman of the Local Board (Mr. F. Barlow) writes as follows to a London daily contemporary: "The Company have only a very small stock of coal, and are buying at ruinous prices rather than stop making gas, as the principal manufacturers of the town are dependent on gas for their motive power; and any failure on the part of the Company would result in the temporary stoppage of the trade of the town. I believe the town generally appreciates the effort the Company is making; and there has been no application to them to sell coal, no procession, no boycott, no single customer has ceased consuming, nor has there been a single request to remove a meter."

MISCELLANEOUS NEWS.

COMMERCIAL GAS COMPANY.

The Ordinary General Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. J. BLACKET GILL in the chair.

The SECRETARY (Mr. H. D. Ellis) read the notice calling the meeting; and the report and statement of accounts, which appeared in the last number of the JOURNAL, were taken as read.

The CHAIRMAN, in moving "That the report and accounts be received and adopted, and entered upon the minutes," said he did not think he need occupy the time of the stockholders at very great length, as he believed they would agree with him that the accounts placed before them were satisfactory. They would see that the Company had an increased rental of about £13,000; and the decrease in the price paid for coal came out at about the same amount. The first item was occasioned, as the proprietors were aware, by the advance in the price of gas; and the second resulted from the saving in coal arising from the fact that this time last year the Company had to pay something like £10,000 more on account of the Durham coal strike, and residuals had stood them in fairly good stead. They had an increase of £850 in coke, of £480 in tar, and of £370 in sulphate of ammonia; or a total increase in residuals of £1700. There was a decrease of £1350 in the cost of wages; so that really they had spent £133,000 to earn £181,000, and were thus enabled to carry to profit and loss a sum of £48,410. Out of this amount the Directors proposed to declare a dividend at the rate of £12 10s. per cent. per annum upon the old stock, and of £9 10s. per cent. per annum upon the new stock, both less income-tax; leaving a balance of about £3000 to be carried forward. As, no doubt, the proprietors were aware, this was not the statutory dividend, which would require ½ per cent. more. But for some time past the Directors had felt that it would perhaps be best not to pay the full dividend upon the present occasion. He was quite sure the proprietors would agree with the Board in this matter, because there could be no doubt that raising the price of gas in their district had created a little feeling against them; and it would not be well to pay this half year an increased dividend arising from the fact of that advance. They must also look at the reverse of the picture. It was only right that the Directors should place before the proprietors the bad as well as the good features; and the general business of the Company, they had to admit, had not been so good for the past half year as they could have wished—showing a decrease of something like 3 per cent. This was a very serious thing. Of course, if they had a somewhat reduced rental, they might have a lower dividend (he had to speak with bated breath); but the great thing was to increase the business of the Company. There were two causes, he thought, that accounted for the falling off in the business. There was, first, the exceptional weather enjoyed during the past six months, and which had been very good for holiday makers, but not so good for gas makers; and, in the second place, there had been the unfortunate depression in trade, which was felt perhaps more in the East-end of London than anywhere else. In the Company's district, work yards which used to be busy with the clang of the workmen's hammers had been closed; and in some cases, he regretted to say, those very workmen had themselves been the cause of the stoppage. The proprietors would have noticed that the bad debts of the Company amounted to £900, which was an increase of about £150 as compared with the corresponding period of last year. In going through the list of these debts, as he had done, he had been very much struck by the enormous number of very small sums; showing that the times had been rather hard upon many of their poor customers. He need scarcely say that the Company's collectors did their utmost to get in the money. It was to the Board a matter of the most sincere regret that they were compelled, by circumstances which were too strong for them, to raise the price of gas. It would be recollected that they did not do this until they had drawn upon their reserves to the extent of something like £70,000; and then the Directors deemed it necessary, in the interests of the Company, to make an immediate increase. They felt fairly confident, however, that there was nothing so good for stimulating business as selling gas at the lowest possible figure. This was the end and aim of the Company; and he could only trust they would be able to continue this policy in the future. He had much pleasure in announcing that the Board proposed, at Christmas, to reduce the price by 2d. per 1000 cubic feet, which would bring it down to 2s. 7d. He trusted this reduction would be an acceptable Christmas-box for the consumers. The proprietors would doubtless be anxious to learn whether there was any necessity for alarm with regard to the unfortunate dispute in the coal trade. The Company's stock of coal had, he was pleased to say, been well maintained; and, as they were aware, their coal came from Durham, to which the strike movement had not as yet reached. They need, therefore, have no anxiety upon this score, although they might express the hope that the strike would shortly come to an end. It did seem a perfect satire upon this advanced nineteenth century that disputes between master and man had still to be settled by the wretched process of starvation and strikes, which inflicted so much misery upon tens of thousands of people. With regard to testing the illuminating power of their gas, the Company had had some little trouble with the London County Council, who sought to test with candles somewhat different from those which the Directors believed were provided for by the Act of Parliament. As the matter was still *sub judice*, he would content himself with only just touching upon it. At the same time, however, he might say that their excellent Engineer was going into details with respect to it; and they hoped to obtain relief. The Company really had to provide gas of very high illuminating power, when a lower quality would answer every purpose. People abroad were satisfied with 12, 13, or 14 candle gas; whereas in England a very high-quality gas had to be supplied for the purpose of cooking chops, steaks, &c., in the middle of the day. If they could be afforded some relief in this direction, it would be of great advantage to the consumers. He wished to remind the proprietors that, when referring to the likelihood of the reduction in the price of gas by 2d. per 1000 cubic feet being made at Christmas, he did not say "if nothing of a quite unforeseen character should occur before." He did not suppose anything would happen; and there was no doubt that, in the ordinary course of things, the price would be reduced. Still something quite unexpected might occur; and therefore he mentioned the fact. It was quite the wish of the Directors that the reduction should then be made. When the shareholders met last year he told them, as they would recollect, that the Company had started the "coin meters" in their district; and, so far, they had been attended with a very considerable amount of success. They had had a good number of applications—some 860—for these meters. During the past ten weeks they had fixed no less than 112; and they would increase the number as time went on. As he had told them before, the Company had in their district no less than 75,000 houses in which gas was not burnt; and, of course, it must be their object to try and get the occupants to use it. As they were perfectly aware, the working man was not a very thrifty soul; and he would rather pay a few pence per week for his oil than have the gas laid on at the expense of a few shillings. The Directors fancied that the introduction of this "penny-in-the-slot" business might lead him to alter his opinion. At any rate, they hoped it would be so, and prove a benefit to the Company. He was pleased to say that the works had been maintained in good condition. Their main connection for joining Wapping with their existing system had been carried out; and the Engineer had achieved a great success. They hoped to obtain a good result in consequence. They had 4051 stoves out on hire, which was an increase of 150 stoves since this time last year. During the past six months they had not had any troubles with their men; indeed, their relations with them had been very satisfactory. With the prospect of a revival in trade, he hoped the proprietors might look forward to a more gratifying statement next time the Directors had the pleasure of meeting them.

The DEPUTY-CHAIRMAN (Mr. R. Jones) seconded the motion.

Mr. G. ENNIS said he was happy to be able to compliment the Directors upon the report they had submitted, and also on the fact that they proposed to reduce the price of gas by 2d. per 1000 cubic feet. He only wished to make one observation, and that was that he hoped the Board really had it in their power to lower the price by 3d., but that they preferred to reduce it by 2d. only, and thus keep 1d. in hand for other purposes, and for offering consumers, especially the working classes, additional facilities for using gas in the middle of the day by means of stoves. Where consumers could not get a good light, better burners might be provided and fixed by the Company free of charge. He trusted the Board would be able, on the next occasion, to announce the payment of a dividend at the statutory rate.

The CHAIRMAN, in reply, said the Directors already offered the consumers many facilities, and did all in their power to make the Company appreciated in as liberal a way as possible. They also tried to show the working man the great advantage it would be to him to employ a gas-stove. It was a very difficult task; but he hoped the working classes would begin to see that these stoves were a very good thing to have, with gas at a low price. The Company's policy was to keep it as low as possible.

The motion having been carried unanimously,

The CHAIRMAN proposed the payment of dividends at the rates of 12½ per cent. per annum on the old stock, and 9½ per cent. per annum on the new stock.

The DEPUTY-CHAIRMAN seconded the motion, and it was adopted.

A vote of thanks was then accorded to the Chairman and Directors, on the motion of Mr. R. HESKETH JONES, J.P.

The CHAIRMAN briefly acknowledged the compliment, and proposed a vote of thanks to the Chief Engineer (Mr. H. E. Jones), Secretary, Accountant, and clerks, for their services during the half year.

Mr. R. JONES seconded the motion; and it was carried.

Mr. H. E. JONES, in acknowledging the vote, said there was a spirit of loyalty in the staff in working for the interests of the proprietors, and they took very great pride in the Company. With regard to the remarks made by a proprietor in connection with offering facilities to their consumers, he might say that, in addition to fixing stoves without cost, the Company charged the lowest rental for meters, and for the smallest size they charged less than half of what was paid to other companies. They had for years been trying to get working men to use gas. They had offered to supply fittings on the hire-purchase system, the amount being paid back by instalments; and they had made other arrangements, which he was bound to state had never succeeded very well. He was pleased to be able to say now, however, that the new "penny-in-the-slot" meter had "caught on" very much with the working man, who preferred to know exactly what his expenditure was, than to wait for a bill at the end of the quarter. The price they charged for gas supplied through an automatic meter was slightly raised, to cover the cost of the meter and fittings. This, however, was no impediment to its adoption.

The SECRETARY also briefly returned thanks; and the proceedings then terminated.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

The Half-Yearly Meeting of this Company was held last Saturday week—Mr. E. FOTTRELL, J.P., in the chair.

The SECRETARY and GENERAL MANAGER (Mr. W. F. Cotton) read the notice calling the meeting; and the report and accounts, of which an epitome was given last week, were then presented.

The CHAIRMAN, in moving the adoption of the report, said he had on this occasion to make but few remarks. Having regard to the high price of coal, particularly cannel, during the half year, they could not have calculated that the profit on the working would enable them to declare the dividends last paid without drawing from the reserve fund. However, the Directors felt that the worst had been seen, and they had no hesitation in taking the amount necessary to supplement the profit and loss account to such an extent as would allow the payment of the same dividends as before. There had been a diminution in the amount received for gas of 3·8 per cent.; and this was mainly attributable to the bright weather and high temperature of the atmosphere during the half year. On reference to the reports

of several other companies and local authorities, he found the same remarks were made. The sale of gas having been reduced, the quantity of coal carbonized was less by 5500 tons; but still the working expenses could not be decreased. The sale of residuals also showed a falling off; and this was attributable to the low price of coke. With regard to the present half-year's working, they might fairly anticipate a better result. The Directors had been fortunate in making contracts for coal and cannel on the eve of the strike, at prices favourable to the Company. The demand for gas for other purposes than illumination continued to progress. There were at present 242 engines, working to the nominal horse power of about 2000. There was also a fair increase in the use of gas-stoves; but still not at all equal to the number employed in other large towns. The new condensing and washing apparatus alluded to in the report would be of much assistance; being the means of a double purpose—viz., increasing the production of sulphate of ammonia, which article, he was pleased to say, was improving in value, and enabling them with more effect to take out any impurities remaining in the gas. Before concluding, he bore testimony to the assiduity of the officers in each department.

The DEPUTY-CHAIRMAN (Mr. John R. Wigham) seconded the motion, which was passed unanimously.

A dividend of 10½ per cent. per annum on the old shares and 7½ per cent. on the new shares was then declared; and the thanks of the shareholders were accorded to the Chairman and Directors and the officers for their attention to the business during the half year.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly Assembly of the Proprietors of this Company was held last Thursday, at the Offices, 16, St. Helen's Place, E.C.—Mr. GEORGE BANBURY in the chair.

The SECRETARY (Mr. I. A. Crookenden) having read the notice convening the meeting, the report and accounts, of which a summary appeared in the JOURNAL on the 26th ult., were taken as read.

The CHAIRMAN said it might probably have struck the shareholders that there had not been carried over so large a sum as at that time last year; but there were several causes which more than accounted for this. Thus, the law and parliamentary charges exceeded last year's figures by £540. This was owing to their having had to defend their interests before Parliamentary Committees, and to the final settlement of their charges on account of the Royal Commission. He might say that their outlay under the latter head came to £2000. The payment to be made to the Chamberlain of the City of London under their Act of 1886 was £2276, or £800 more than their last disbursement. He did not think they could possibly look forward to the time when they could close their capital account, as extended demands for water necessitated further outlay in satisfactorily furnishing it; and thus every issue of fresh capital increased the sum which they must annually pay to the Chamberlain. Although their water had a high character for purity, still, in order that nothing might be wanting as regarded their filter-beds, they had been, and were still, purchasing more sand for filtration; and this outlay during the past half year came to £1577. There had been a large additional demand upon them for the ever-increasing rates and taxes; the excess being £1037. This was, he need hardly say, a charge over which they had little or no control, although it was a very heavy one, amounting annually to more than £27,600, which was equivalent to their paying the parishes nearly 3s. 2d. for each supply out of their collections. The revenue of the Company went on increasing slowly, but, it was to be hoped, surely, both for the domestic and meter supplies. He wished he could say that houses of a better class were being built in their district. But that was not the case, except perhaps at Stamford Hill, as during the past half year the rateable value of the new tenements was so low that their water-rate thereon only averaged £1 2s. 2d., which was less than that of the new supplies for 1891 and 1892. As regarded the progress of the works, the Lea Bridge well, which was at one time the cause of so much trouble and anxiety, now yielded a bountiful supply; and they were still unable, although pumping 3 million gallons a day, to get the water down so as to allow the workmen to resume driving the headings. The wells at Waltham Abbey and Walthamstow were doing them good service; and the Chingford well, concerning the success of which they entertained no doubt, was being sunk successfully and economically by their own men, under the supervision of their Engineer (Mr. W. B. Bryan). Good progress had been made with the engines, which were being made in Cornwall, and with the necessary buildings for their reception at Lea Bridge and Walthamstow. They hoped before Christmas to have the Walthamstow engine at work, for supplying the much-increasing wants of their Essex district. As their Bill to enable them to raise new capital was rejected during the past session, it had not been possible for them to begin the construction of the new reservoirs at Walthamstow, as advocated by the Water Examiner (General A. de Courcy Scott), for which the necessary land had already been acquired. As he had probably mentioned before, their present storeage was 720 million gallons; but when they had made the projected improvements, for which they had acquired the land, they would bring it up to 1200 million gallons. The Directors must congratulate the proprietors upon having been able satisfactorily to maintain their supply during this long and unprecedented drought. They had indeed had a most trying and anxious summer; and the rainfall had been sadly deficient. At some of their stations, only 5 inches had fallen during the last six months, which was less than half of the average at those places during a series of years. It had therefore been a subject of relief, and, he might even say, of surprise, to find that the River Lea had not failed them, but had more than maintained its character as one of the two natural and bountiful sources of supply for London. This continued flow was owing to the river being fed by springs from the chalk over which it passed, and which equalized, to a great extent, the variations in the rainfall. This was clearly shown by the exceptionally pure state of the water during a very dry season. The good supply furnished by the River Lea, aided by the storeage in the reservoirs and by the wells in the chalk, had enabled them to deal with the severe demands upon their capabilities. He thought they might say that this most exceptionally dry season had practically demonstrated that the resources of the Lea Valley were greater than many had supposed. The Directors were glad to state that the water supplied by the Company continued to maintain its high standard of purity. The Government Analyst reported to the Local Government Board that "the water of the East London Company was efficiently filtered before delivery, and was much improved chemically, whilst 99·26 per cent. of the microbes were, on the average, removed by storeage and filtration." This, they might say, practically eliminated the whole body of bacteria; so that he did not see how they could very well do more in this respect than at present. It must also be remembered that, fortunately, the pathogenic or dangerous microbes were far fewer in number, and of more delicate organization, than their enemies, the harmless microbes, which diminished and destroyed them. Thus Dr. S. Woodhead, when speaking of the Asiatic cholera microbes, said "they cannot brook the presence of vulgar bacteria," which were innocuous. If, therefore, their filtration left only ¾ per cent. of organisms of all sorts, the chances were infinitesimal against any dangerous germ having an opportunity of doing any harm; more especially as Professor Odling was of opinion that "the tendency of the evidence is to show that it wants a very considerable dose of pathogenic organism to produce its characteristic disease." The Government Analyst had also reported that, during last May and July, the East London water was "so efficiently filtered that it was then fit to be classed with the deep-well waters." As regarded the report of the Royal Commission, which had only recently been put into their hands, the Directors were of opinion that more time than had been yet available should be spent in the careful consideration of its contents, before any confident conclusions could be formed as to its effect upon the Company's interests. As to the staff, their Engineer had been with them for twelve years, and was as valuable to them as ever. As long as health and strength continued, their important interests and works were in excellent keeping. Their Secretary, aided by an efficient staff, carried on his work with tact and assiduity. They received substantial aid from him in any Bills before Parliament, in legal cases, and in the complicated questions of their rating by the parishes. It was of the most serious importance that they should be granted power to raise fresh capital for fulfilling their legal obligations. Last session, when their Bill was rejected, there seemed to be an idea abroad that the Company's application was unnecessary, and that, as they were well off for water, new houses could be supplied, as it were, automatically at little or no outlay. These misapprehensions, he trusted, no longer existed; and they might reasonably hope that the powers asked for might next year be given to them. They would then be able both to fulfil their legal duties to an increasing population, to improve their pressure, to begin the additions to storeage, and, in fact, to carry out further measures that might be found necessary to meet the requirements of the consumers. He concluded by moving the adoption of the report, and the payment of a dividend of 8 per cent. per annum, less income-tax.

Mr. H. DALTON seconded the motion.

Mr. BROWN said that, judging from the attendance, there did not seem to be any objection on the part of the shareholders to the report. He thought they should be very careful as to the way in which they spent their capital, and that they ought not to lay out more than they were forced to do. He belonged to several Water Companies; and he knew that they were subjected to considerable outlay through the inquiries which were so often held respecting the water supplies. The Companies had to find the money to defend their interests out of their own pockets; whereas the expenses of the other side were provided for out of the rates. He hoped that, in view of the report which had been presented by the Royal Commission, they had now heard the last of these continual inquiries.

Dr. CHESSHIRE remarked that the public did not seem to distinguish the difference between pathogenic and other microbes. The world abounded in microbes; and it would be quite impossible to get on without them. Only a small proportion of the microbes in water were dangerous; while a very large proportion of those in existence were absolutely necessary to the benefit of the people's health.

The CHAIRMAN, in reply, said that they were not likely to expend more capital than they could help. But for their desire to fulfil their obligations to their customers, they would not have asked Parliament for power to raise money last session; and they would be only too glad to be able to close their capital account. By the arrangements made in connection with their Act of 1886, as long as they paid 8 per cent. to the shareholders they would have to pay to the City Chamberlain 2½ per cent. on new capital raised. He could only hope, with Mr. Brown, that there would be no more inquiries into the water supply, which were very expensive to the Companies.

The motion was carried unanimously.

Mr. BROWN proposed a vote of thanks to the Chairman, Directors, and officers, remarking that, as a body, the shareholders were perfectly satisfied with the position of the concern.

Mr. GOODWIN seconded the motion, and commended the Directors for their "new departure" in suing people for their rates when they did not pay the Company, instead of cutting off their supply.

The motion was carried unanimously.

The CHAIRMAN, in reply, assured the proprietors that the principle on which the Directors endeavoured to conduct the business of the Company was to afford satisfaction and contentment both to the consumers and to the shareholders, whose interests were, in fact, identical.

The proceedings then terminated.

Rain-Making Experiments in Dublin.—Dublin, like many other places, has been seriously inconvenienced by the long drought; and an attempt has lately been made to promote rain by the discharge of explosives into the air. Three dozen distress signals and a dozen rockets were sent up—the latter rising from 1500 to 2000 feet, the former not quite so high. About 10 lbs. of tonite were also exploded on the ground. A copious fall of rain followed, which lasted about an hour and a half.

NOTTINGHAM CORPORATION GAS SUPPLY.

Annual Financial Report—The Meter-Rent Question.

At a Special Meeting of the Nottingham Town Council yesterday week—the MAYOR (Mr. A. Brownsword) presiding,

Alderman BARBER, the Chairman of the Gas Committee, moved the adoption of the report of the Borough Auditors on the gas undertaking for the year ending March 31. It stated that the cash receipts for the year amounted to £275,339, and the cash payments to £270,449; the balance being therefore £4890. The expenditure on capital account was £5781, which had been provided out of a further loan of £10,000. The balance unexpended on capital account was £8855. The income on revenue account was £224,674; being an advance of £2891 on the previous year. The expenditure on revenue account amounted to £155,170; being an increase of £3439. Consequently there was a decrease in the profit of £548. The general summary of the balance-sheet showed £235,692 on the credit side, and £211,644 on the debit side, of which it was proposed to appropriate £24,000 in aid of the general district rate. The reserve fund had now been reduced from £100,000 to £84,299—£15,701 having been realized and transferred to the renewals account.

Alderman FORD seconded the motion, which was carried.

Mr. GREGORY afterwards submitted a motion of which he had given notice, to the effect that the Gas Committee be instructed to abolish all meter-rents. He assured the Council that there was a very strong feeling on the matter in the town; and those members who were frequently before their constituents, were well aware that it was not a question of whether 2s. 8d. or 4s. per 1000 cubic feet should be charged, but entirely one of principle. He was told that his motion was opposed on two grounds—first that, if they abolished meter-rents, they would lose £6000 a year, and, secondly, that it was not right to extend the same privilege outside the borough as inside. On the first ground of objection, he thought he might say that the Vice-Chairman of the Gas Committee, at the last meeting of the Council (see *ante*, p. 497), said they contemplated reducing the price of gas by 2d. per 1000 cubic feet. Then they were told that the taking off of the meter-rents was too much for one year, and that there would be a loss of £6000. He contended that, if it were an unjust charge within the borough, it was equally so outside. There were 26 villages supplied with gas; and taking into consideration the population of the borough and the number of meters—36,275—he thought his motion would be popular. The introduction of the electric light would probably affect the consumption of gas; and he maintained that, to do away with meter-rents, would increase the number of consumers.

Mr. SHARKEY, in seconding the motion, pointed out that the Gas Committee had already commenced supplying "penny-in-the-slot" meters free of charge; and they had expended a considerable amount of money in purchasing them. If the Gas Committee did not supply 33·3 cubic feet of gas for a penny to the poor people who used these meters, they did them an injustice. If they did, why give them a meter free of charge, and make their neighbours, who were willing to consume a larger quantity of gas, pay for their meters?

Alderman BARBER said that, before the Council took a step like that suggested, they must learn how the money that would be lost was going to be recouped. Many of the meters would return them but a very small profit, although they would have to retain the whole of their staff to inspect and keep them in order. Not one consumer would use a single foot of gas more if he had to pay nothing for his meter. It was not a matter for the Gas Committee; but he had felt it right to say this in reply to the mover of the resolution. If they carried out the proposition, on March 31 they would have a financial deficiency of £3000, and a deficiency of £6000 every year afterwards.

Alderman FORD remarked that they had 27,000 small meters at 8d. per quarter, which was a halfpenny per week; and he did not think this would prevent anyone taking gas. Then there were upwards of 2000 private meters, the whole of which they would have to purchase if the resolution were adopted.

Mr. BAGGALEY was certain that nearly half the residents did not consume gas because of the gas-meter rental. Last year the Committee made £25,000 profit; and they were considering the question of a reduction of price. It meant, if resolved upon, that there would be a little less profit; and, if the Council passed the resolution, they would gain the good wishes and thanks of nearly the whole of the working classes of the town.

Mr. J. BRIGHT said, when they looked at the question from a practical point of view, the difficulties seemed to be very numerous. The ratepayers had invested in the undertaking £914,000; and the whole responsibility rested with them, apart and distinct from the consumers. After paying a very low rate of interest upon the capital borrowed to carry on the undertaking, the profit last year was £24,048. He thought all business men would say that, considering the large stake the Corporation had in the concern, this was a very small profit to accrue. With regard to the meters themselves, the Committee made no profit whatever out of them. The cost of keeping them in repair during the year was £3028; and the capital expenditure on them was £63,803. Therefore, if they took the amount it cost to keep them in repair and interest alone, without providing anything for depreciation, the amount received from the meter-rents practically did not pay their cost. Besides this, to purchase the 2200 meters owned by consumers, would cost nearly £5000. The average consumption of gas by the 3-light meters represented about 16s. a year; and it would be far better for the small consumer that the price of gas should be reduced 2d. per 1000 cubic feet than that the meter-rents should be abolished. It should be borne in mind that the present average price of gas was 2s. 5d.; while, when the undertaking became the property of the Corporation, the price varied from 3s. 1½d. to 3s. 4d.

Alderman RENALS asked Mr. Gregory to withdraw the resolution in face of the unanimous opposition of the Gas Committee.

Mr. BROWN said he understood that a few years ago there were 24,000 houses in Nottingham unsupplied with gas; and he felt sure it would add very much to the profits if some such suggestion as that proposed could be adopted. He moved, as an amendment, that the subject be referred to the Gas Committee for consideration.

Alderman RENALS seconded the amendment.

Mr. PYATT said he should oppose Mr. Gregory's motion on the ground that they would be favouring the outlying districts by reducing their charge, which, in his opinion, was already too light; but if he would put at the end of the motion the words "in the borough," he should vote for it.

After a little further discussion, the amendment was put to the vote, and carried by 24 votes to 17; and the motion was accordingly lost.

THE MANCHESTER CORPORATION AND METER-RENTS.

Two resolutions relating to the abolition of the charges at present made for the hire of gas-meters appeared on the *agenda* for the Manchester City Council meeting last Wednesday. The first of these stood in the name of Mr. Saxon, who announced that there had been no pre-arrangement between himself and Mr. Hampson, who had given notice of the other motion on the subject; but they had since decided to submit a slightly altered form of resolution embodying their joint suggestions. This amended resolution, which he proceeded to move, was in the following form: "That this Council is of opinion that the charges for the hire of gas-meters supplied by the Corporation should be abolished, as the present charges for meter-hire rest too heavily upon the small consumers of gas—making the cost almost prohibitive to them; and that the Gas Committee be instructed to again consider whether they will recommend the abolition of these charges." He remarked that the subject was very much in the minds of members of the Council, and was popular with candidates at the municipal elections. If the Gas Committee accepted the resolution, the candidates at the forthcoming elections would hardly thank them; for it would deprive them of a subject upon which they could enlist the sympathy of the burgesses. The abolition of meter-rents would, however, confer very great benefits upon the poorer consumers of gas. He hoped the Committee would act up to the spirit of the times, and that Manchester, which prided itself on being in the forefront of municipal enterprise, would not be behind other Corporations. At present, Edinburgh, Birmingham, and even Salford, were before them in this particular matter. The Salford Corporation had recently decided to relinquish these charges, at a loss of revenue amounting to between £4000 and £5000 a year. The Chairman of the Gas Committee (Mr. Brooks) interposed at this point, and said he was prepared to accept a resolution recommending the Committee to re-consider the question of the abolition of meter-rents. At the same time, he wished the Council to remember that many of the ratepayers objected to any augmentation of the rates; and, of course, the abolition of meter-rents would mean this. Mr. Saxon said that all he desired was that the Committee should consider the question and report upon it. Mr. Hampson, who had arranged to second the motion, concurred. The Council thereupon unanimously adopted a resolution formally instructing the Committee as desired by Mr. Saxon, and omitting the preliminary portion of his motion, which expressed an opinion in favour of the abolition of the charges.

PROPOSED PURCHASE OF THE KENDAL GAS AND WATER WORKS BY THE CORPORATION.

At a Meeting of the Kendal Town Council on the 26th ult., the subject of the purchase of the undertaking of the Kendal Gas and Water Company was under consideration. It arose on a resolution brought forward by Mr. Alderman H. Wilson, to the effect that immediate steps should be taken (including the employment of a Water Engineer) to promote a Bill in the ensuing session of Parliament for the transfer of the gas and water works to the Corporation. He said the matter had been before them for years; and the proposal assumed more importance and gathered fresh force whenever the seasons proved unfavourable to the supply of water. The existing evils could be remedied by the course of action now proposed; and he believed also that, if the Corporation possessed gas-works, they would have better and cheaper gas. Mr. H. Braithwaite, who seconded the motion, also addressed himself to the matter of water supply, and contended that the growing needs of the town, both on account of increased population and on sanitary grounds, had not been met by extension of supply. If the supply was to be extended, someone must go to Parliament for an Act; and he thought the time had arrived when the Corporation should undertake this duty. It was suggested that they should acquire the water-works, and leave the gas-works. He, however, did not think this would be desirable, or even possible, because the works had been combined for years, and Parliament would not, he believed, allow the concern to be divided. Mr. Harrison urged the necessity for careful consideration of the question. They did not, he said, know how the quantity of water was to be increased, nor, if the Company's plant was inadequate, how much would be required to make it efficient. Then with regard to gas, there was the possibility that it might be superseded by the electric light. Mr. J. Monkhouse said the question had been to the front from at least as far back as the year 1881. In 1884 the Council were so satisfied with the arguments he placed before them, that they almost unanimously resolved to apply for an Act. But some of the gentlemen on the Committee which was appointed were only half-hearted, and the others were dead against it; so that the thing fell through. In 1889 he revived the subject; and Mr. Silverthorne was engaged to make a report. The question seemed then in a fair way for settlement. The Company decided upon a price, and the Corporation made a counter-offer; but the Company had never replied to it. There was, however, a difference of only £4000 or £5000 between the figures. He contended that the Corporation had every encouragement to proceed in the direction suggested. At Lancaster, where the price of gas was formerly 4s. 6d. per 1000 cubic feet, it was now 2s. 3d.; and a large profit was made every year by the Corporation. If they took Penrith, they saw the same results; for whereas in 1878 they made 10 million cubic feet of gas at 4s. 5d. per 1000 cubic feet, they were now making 30 millions at 4s. 5d., and had spent many thousands of pounds on the works. At Ulverston, Barrow,

Carlisle, Cockermouth, Workington, and Maryport, they had exactly the same results. Gas was supplied at 50 per cent. less price, and the local authorities made large profits. In the matter of water, it was the same. As to the electric light, it was where it was ten years ago; and it was not at all likely to interfere with the sale of gas in Kendal. Alderman T. Baron said the water supply was really the whole question. They could not say that the water was either adequate in quantity or good in quality; and it seemed that it was proposed to go to Parliament to buy that which was neither good nor sufficient. Their wiser course would have been to learn what it would cost to get a good supply of water. Mr. G. J. M'Kay contended that the time had now long gone by when the Corporation should take up a gas and water scheme. He was in favour of their having the water supply; but if they acquired the gas-works also, they would saddle the town with a debt which no one living would see paid off. The places mentioned by Mr. Monkhouse, where gas undertakings had proved so successful, had increased immensely in population, while Kendal had stood still. The proposal was fraught with the greatest difficulty. On the motion being put, 11 voted for it; this being short of a majority of the Council. Mr. Edmonson expressed the hope that those who saw the necessity for having a good supply of water would come over to their side, seeing that they were practically unanimous on this point. A further vote was then taken, with the result that 13 were in favour of the motion; and a Committee was afterwards appointed to give effect to it.

Referring to the above matter, a local correspondent writes: "The decision of the Kendal Town Council to take action with a view to the acquisition of the local gas and water works is perhaps the natural outcome of the agitation which has been carried on against the Company in the past few months; but it is nevertheless a policy respecting which much difference of opinion exists in the district. If their critics may be believed, the Company have failed to satisfactorily discharge one part of the duty which lies upon them. For years there have been complaints of the inadequacy of the water supply; and the Company, instead of boldly facing the situation, have, it is alleged, been content with makeshift devices, which have failed when put to the proof. It is true that the past summer has been of an exceptional character. Kendal is by no means the only town whose water supply has proved inadequate to meet the demands of consumers during the prolonged drought. But, in the opinion of the Corporation, this state of things need not have existed had the Company realized their responsibilities, and utilized, as they might have done, the natural advantages of the district in the matter of water supply. All this may only be meant to depreciate the value of the Company's property, with a view to its transfer to the Corporation at something less than a fair valuation. The Company will, no doubt, have something to say in their own defence, either at the inquiry which the Local Government Board were recently asked to hold on the spot, or before a Parliamentary Committee, should the matter be carried so far. In the meantime, it is not uninteresting to observe that, although the Corporation are professedly most concerned about the water supply, they have an eye to the possible advantages of acquiring the dual undertaking. A suggestion that the two works should be separated, and that the Corporation should be content to undertake the supply of water, and leave the Company in possession of the gas-works, met with a very cool reception from the majority of the Council. Indeed, the whole project was looked upon with some doubt, for, on a first vote, its supporters failed to get the requisite clear majority of the Council on their side; and it was only after the waverers had been earnestly exhorted to 'come over and help us' that the resolution met with legal approval. Judging from both the speeches and the voting, many members of the Corporation are anxious to do a little dividend-hunting at the expense of the Company; but they are sorely afraid lest the much-talked-of necessity for new water-works should dissipate any profit which the Company now enjoys, and saddle the ratepayers with new burdens."

KEIGHLEY CORPORATION GAS SUPPLY.

Annual Report—The Effect of the Stokers' Strike.

At the Meeting of the Keighley Town Council last Tuesday, the annual report of the Gas Manager (Mr. John Laycock) was submitted. It appeared from this that the receipts from the sale of gas during the financial year had been £21,568, which was rather less than in the previous twelvemonth; but this was more than due to the non-inclusion of the receipts for public lighting for six months. Considering the conditions under which they worked all last winter in reference to the stokers, and the consequent loss of coal, gas, and wages, Mr. Laycock was glad to be able to report a gross profit of £5668, as against £8087 in the previous year. If, however, the cost of lighting the public lamps (amounting to £912), and the fitting up and lighting of Victoria Park (£214), which had been done free of charge, be added, and the reduced receipts for tar (£860), the extra repairs to works (£360), and taxes (£160), be also taken into account, the profits would equal those of the previous year. In reference to the strike at the works, it was stated that from November up to the strike in March, the work done by the stokers had been so unsatisfactory that the profits had been affected to a considerable extent; but since then the men had for some months worked in a satisfactory and creditable manner. The greatest trouble at present was occasioned by the coal strike. Before this began, they had a stock of coal which would last nine or ten weeks; but this had been consumed, and for the coal now being used, they were having to pay very heavily. They had also the greatest difficulty in getting coal of any sort; and the Manager estimated at present, considering the lower quality of the material, and the extra price they were having to pay, that the loss amounted to £25 per day. The question of the electric light was referred to at considerable length; and it was mentioned that arrangements were being made to inspect the installations at Leeds, Bradford, Morecambe, and in other towns. It was estimated that the cost of a plant to supply the principal streets in Keighley would be from £15,000 to £20,000. There was some discussion on the report, in the course of which the Gas Manager, replying to a question, said that personally he should prefer that the stoking-machines should not be worked further in the present retort-house, but removed to the one which was to be erected. There was not the least doubt that they would be a success in the new place; but the existing building was hardly suitable for them. In answer to another member, he said they would have had increased profits for the past year if the work had been done properly. The fact was they had had 1700 tons of coal to pay for more than they would have had if the work had been what it ought to have been. All the winter they had nothing but trouble with the men; and this trouble was shown, as they expected would be the case, in the waste of coal and gas. The report was eventually approved; and it was decided to apportion the profits as under: Sinking fund account, £1390; reserve fund account, £201; and general account to assist the rates, £1150.

THE SUGGESTED PURCHASE OF THE ALTRINCHAM GAS-WORKS BY THE LOCAL BOARD.

Rejection of the Proposal.

The advocates of the purchase by the Altrincham Local Board of the undertaking of the local Gas Company received an unexpected rebuff on Thursday evening. A meeting of the ratepayers was called to approve the resolution passed by the Local Board, by which it was decided to give £162,500 for the concern, and to promote a Bill next session sanctioning the transfer. Mr. G. Bowen, Chairman of the Board, presided over an assembly which from the outset manifested hostility to the proposal. A remark by the Chairman, that the Directors of the Company were not willing to sell, was received with derisive laughter. He explained that the price for the works was made up in this way: Market value of "A" shares, £80,000; do. of "B" shares, £68,000; reserve fund, £6000; goodwill of 10 per cent. on forced sale, possession of full rights and powers, £14,000—total, £168,000, which had been reduced by negotiations to £162,500. The Local Board thought it advantageous to buy at the last-named figure, as they believed the transaction would turn out profitable to them. In the first place, £620 a year would be saved in the way of salaries of collectors. The purchase-money could be borrowed at 3½ per cent., and the repayments would extend over 50 years, with the result that at the end of this period the profits made would enable them to pay off the principal and interest without taking a penny out of the pockets of the ratepayers. Added to the purchase-money was the sum of £125,000 for extensions in the next 50 years, which sum would also be provided for out of the profits. Thus the works and extensions would become the property of the ratepayers without costing them anything; and over and above that they calculated having £180 per annum at their disposal. He maintained that they could not buy the concern for less money. Compulsory purchase would mean a large expenditure in arbitration proceedings, and an opposed Act of Parliament. In 1872 they could have bought what was supposed to be worth £162,000 for £54,000. If they had purchased at that figure, they would have had £93,000 in profits by this time. In 1884 they could have bought the undertaking for £120,000; and had they purchased then, they would have paid off £10,000 out of profits. Was it wise to let history repeat itself again in this matter? He argued that they had nothing to fear from electric lighting. Even if the latter illuminant superseded gas entirely, they had powers to purchase the plant from the local electric light company at cost price, *plus* 7½ per cent. Mr. J. Newton, a member of the Board, followed with a long speech in support of the purchase. Mr. J. N. Sidebottom, also a member of the Board, opposed the scheme, chiefly on the ground that the electric light was a dangerous rival to gas. Other speakers followed in the same strain. In the result, the resolution in favour of the purchase was rejected.

Higham and District Water Supply.—The Higham and Hundred of Hoo Water Company have elected Mr. G. R. Anderson to the position of Chairman. The Company, which is a new one, have completed their works, and laid mains through about 6 miles of a populated district. An excellent supply of water has been obtained. Mr. E. Easton is the Engineer; and Mr. R. Prall, the Secretary.

A Combined Sewerage and Electric Lighting Scheme for Monmouth.—The Monmouth Town Council have adopted a scheme, drawn up by Mr. C. N. Lailey, of Westminster, which provides for the drainage of the borough, the disposal of the sewage, and the supply of electric light for public and private purposes. The cost of carrying this out is computed at about £16,000, which, it is proposed, shall be repaid in 30 annual instalments of £821, necessitating a rate of 10¼d. in the pound for the next 30 years. Deducting the present cost of gas for the public lamps, and adding to that the anticipated earnings of 500 16-candle power incandescent lamps for private use, the estimated annual instalments will be reduced to about £400, requiring a rate of 5d. in the pound. The maximum motive power needed to work the machinery connected with the electric light and the sewerage system will be 60-horse power, and will be supplied by the water of the River Wye. Duplicate machinery, to be worked by steam in case of high floods, will be provided.

Sales of Shares.—Some original stock of the *Morecambe Gas Company* to the value of £40 was recently sold by auction for £85.——At Scarborough, on the 8th ult., Mr. N. Fowler sold £260 consolidated 10 per cent. original stock in the *Scarborough Gas Company* at the rate of £205 per cent.; £620 consolidated new 7½ per cent. stock in the Company, at £155 per cent.; £315 new ordinary 7 per cent. stock, at £145 per cent.; £165 (£132 paid) new ordinary (new issue) 7 per cent stock, at £148 per cent.; and £1791 consolidated 5 per cent. preference stock, at £123 per cent.——At Maidstone, on the 14th ult., £1500 stock in the *Maidstone Gas Company* was sold by auction. One lot of £100 realized £204 10s.; two lots, £205 10s.; and two other lots, £206 10s. Nine lots of £50 fetched £103 each; and a tenth lot, £103 10s. Seventeen lots of £25 each sold at £53 each; two similar lots, £53 10s. each; and another lot, £53 15s.——On the 19th ult., 15 shares in the *Tewkesbury Gas Company* were sold by auction locally at £10 15s. each.——On the 4th inst., Messrs. King and King, of Portsmouth, sold 30 £5 (£4 paid) 1883 shares in the *Portsmouth Water Company* for £8 per share, and 18 £10 fully-paid shares for £28 5s.

THE CRISIS IN THE COAL TRADE.

The following is a record of the principal events of the past week in connection with the great dispute in the coal trade.

Notwithstanding the length of the stoppage of work in Derbyshire, and the great privations the colliers in most mining districts had endured, the majority of them appeared on Monday more determined than ever to resist any reduction in wages. They expressed implicit confidence in their leaders. It was expected that a large number of pits would be re-started in the morning; but these hopeful expectations were, to a great extent, unrealized. In Yorkshire, however, it was estimated that something like 6000 men had returned to work at the old rates; while in the Bolton district about 2000 went back. In Warwickshire, the East Cannock Colliery was re-opened; and the West Cannock pits were being got ready for work. In Flintshire, the colliers at the Mount Pleasant pits took a reasonable course; and it was expected that, by the end of the week, three-fourths of the men would have resumed work. They admitted that in most instances they had no quarrel with the masters, but struck in order to strengthen the position of the Denbighshire men, who were out against a reduction of wages. An important meeting of Mayors was held at Sheffield; the object being to see if it was not possible to formulate some suggestions that might constitute a common basis for friendly negotiations between the Coal-owners' and Miners' Federations. There were present the Mayors of Sheffield, Leeds, Bradford, Nottingham, Derby, and Barnsley. The Mayor of Sheffield (Mr. Alderman Batty Langley) was voted to the chair; and the Town Clerk of Sheffield (Mr. J. W. Pye-Smith) officiated as Secretary. The conference, which was private, lasted nearly three hours. The following resolution was unanimously passed, on the motion of the Mayor of Leeds, seconded by the Mayor of Derby: "That this meeting, being impressed with the great importance of an effort being made to put an end to the unfortunate dispute between the coalowners and the miners, suggests that a deputation from the Coalowners' Association, on the one side, and the Miners' Federation, on the other, should meet the Mayors of Sheffield, Leeds, Bradford, Nottingham, Derby, and Barnsley, with a view to finding and agreeing upon a mode of breaching over the difficulties which have arisen between the owners and the men; and that, accordingly, each body be respectfully requested to appoint a deputation of three of its members, who, together with their Secretary, shall meet each other and the Mayors of the above-mentioned towns at the Town Clerk's Office, Sheffield, on Monday, the 9th of October, at three o'clock in the afternoon, when the Mayors named will be prepared to lay certain suggestions before the conference, in the hope of bringing about a settlement of the dispute." A copy of this resolution was forwarded to the President and Secretary of each Federation. On the London Coal Exchange, the tone was much quieter than on the previous Friday; and prices were unchanged.

On Tuesday, the Coalowners' Federation held two meetings at the Westminster Palace Hotel—the first, a Committee meeting; and the second, a general meeting representing the coalowners affected throughout the kingdom. Both were numerously attended, and lasted for more than four hours. It was unanimously resolved as follows: "The Federated Coalowners regret that the decision of the conference of the Miners' Federation at Chesterfield on Sept. 29 merely reaffirms a proposal which has already been considered and declined. No settlement can be made which does not include a reduction in wages; and, as the miners' representatives decline to meet the coalowners to discuss the question of the proposed reduction, they make it impossible to arrive at a settlement by means of such a meeting." A communication was received from the Town Clerk of Sheffield, forwarding a copy of the resolution given in the preceding paragraph. It was unanimously decided that the invitation should be accepted, and that Messrs. A. M. Chambers, A. Hewlett, and T. Hancock, with the Secretary, should be appointed to attend the proposed conference. A copy of the resolutions passed was sent to the Secretary of the Miners' Federation. The collieries in Yorkshire which resumed work on Monday at the old rate of wages were on Tuesday employing all the hands possible; and a good output was expected. Two more small pits commenced work; and by the end of the week it was believed that something like 30 would be opened—employing from 14,000 to 15,000 hands. Orders for Durham coal were falling off. At a meeting of the executive of the Derbyshire Miners' Association at Chesterfield, it was reported that five collieries in the county had re-started work at the old rate of wages. An application from employers to allow men to resume work for the purposes of colliery repairs only was considered; but it was resolved not to permit any men to work unless the masters would first give an undertaking for all the men to go back at the old rate of wages. Some of the prominent coalowners in Derbyshire stated that the strike was likely to last at all the large collieries till the end of the present month. The South Metropolitan Gas Company again raised the price of coke by 1d. per sack—1s. 2d. for broken, and 1s. 1d. for unbroken.

Speaking on Wednesday at a meeting of the Leeds Chamber of Commerce, the President (Colonel Harding), said he did not see why the Board of Trade could not interfere in the coal strike, which was crippling every industry. He hoped they would do so in the event of an early settlement not being arrived at. A calculation had been made in Leeds that the cost of the disorder in the West Riding incidental to the strike would amount to £130,000; and this would have to be paid by the ratepayers in the district of the West Riding County Council. In addressing a mass meeting of miners at Rothwell, near Leeds, Mr. W. Parrott, agent of the Yorkshire Miners' Association, said that during the lock-out the Association had distributed among its members the whole of the £160,000 which had accumulated. They had finished their money, but they had not given in, as the owners hoped they would; and they were prepared to hold out for ten weeks more. At the Netherseal Colliery, Leicestershire, the men approached the masters on the question of being allowed to return to work at the old rate of wages, but without success. The Manager informed them that the only terms on which work could be resumed were 25 per cent. reduction for the time being, on the understanding that when a general settlement was arrived at the men should be paid the difference if their cause was successful. On the other hand, if the masters came off victorious, the men should continue to be paid at the reduced price. The strikers refused to accept this. It was reported that the Americans have entered into competition in the coal trade of this country. A freight circular issued to shipowners and merchants contains particulars of the chartering of a steamer at Philadelphia to carry coals to London; the rate of freight quoted being 12s. 6d. per ton. Such an event was regarded as unprecedented in the trade. On the London Coal Exchange, it was decided to put up the price of seaborne coal another 1s. per ton. Supplies of gas coal, beyond contract requirements, were small, and made 14s. to 14s. 6d. per ton delivered into barges.

At Manchester, on Thursday, Mr. B. Pickard, M.P., presided over a meeting of the Sub-Committee of the Miners' Federation, at which the invitation to the proposed conference at Sheffield was discussed at some length, and eventually accepted. At a meeting of about 12,000 miners connected with the pits in the Sheffield district, a resolution pledging the meeting to resist a reduction of wages was received with extraordinary enthusiasm; every hand being held up in its favour, amid tremendous cheering. In the course of the proceedings, the Vice-Chairman of the Yorkshire Miners' Union (Mr. Wadsworth) stated that if the owners would offer arbitration on an average based upon the wages paid in 1878, or any year prior to the time when the starvation wages were paid, the men would be prepared to consider it. He believed the men of Yorkshire would die on the roadside before they would yield to the demand for a reduction. Mr. T. Smith, another speaker, regretted that at the forthcoming conference of Mayors and deputations from the Federations, the railway and gas companies were not to be represented. Sufficient money was sent from the miners' offices at Chesterfield to the lodges to pay each member in the district 5s. and each child 6d. This required nearly £5000, and practically emptied the coffers of the Derbyshire Union. The amount had been raised principally by mortgaging the offices and Secretaries' houses at Chesterfield, recently built at a cost of £4000. Affairs in Flintshire were practically settled, and all the collieries which had been standing idle during the wages dispute were again in active operation; the men having accepted the old rate of wages.

At a mass meeting of miners held on Friday at Haydock, Lancashire—Mr. John Turner presiding—a resolution approving of the action of the leaders of the Federation, and their determination to resist a reduction, was submitted. Mr. S. Woods, M.P., said it was absurd to accuse him of keeping the men out. If the colliers were prepared to accept 25 per cent. reduction, he would not stand in the way; and he wanted them to say whether they were prepared to accept such a reduction or any part thereof. (This remark was met by cries of "No, not one penny.") There were now 5000 colliers at work in Lancashire; and they intended to ask those owners whose collieries were in operation to allow the men to work three shifts a day, so that 15,000 would be employed who could then support the other men. The resolution was unanimously adopted. There were six collieries working in Bolton and the immediate vicinity, employing an aggregate of about 2000 men. The pits were besieged by dealers. On the London Coal Exchange, the engrossing topic of conversation was the probable result of the Sheffield conference; and the general opinion seemed to be that an agreement will be arrived at. Prices were unchanged. Gas coal was well held at 14s. to 14s. 6d. per ton; the quantity available being very moderate.

Apologies for bad gas or insufficient supply have been not uncommon at the meetings of Town Councils in Lancashire during the past few days. At many works the stocks of coal and cannel have run out, or nearly so; and the new purchases, at greatly advanced prices, have in some instances yielded unsatisfactory results. The Warrington Gas Committee have been able to keep up their supply mainly because of a good stock of cannel which they had on hand; but the Chairman dropped a hint last Tuesday that, if present prices of coal continue, an increase in the price of gas will be necessary. At Stalybridge, the stock of coal has so far proved sufficient to meet requirements; but coal has had to be bought at Dukinfield. Bolton has also been in the market; and Chorley has purchased coal which, as the Chairman of the Gas Committee said, came from places whence they expected to get it good, although it proved to be simply rubbish. The Chairman of the Darwen Gas Committee stated yesterday week that the strike would put the Corporation to some expense, for, in spite of the contracts which they had for large supplies of coal, they had had to buy at the advanced rates. The Oldham Gas Committee have purchased 7000 tons of coal and 700 tons of cannel at an average price of £1 per ton; this quantity being about equal to a fortnight's requirements. On Wednesday last, only five days' supply of coal were in stock at the Burnley Gas-Works; and, as Mr. Altham, the Chairman of the Committee, told the Council, this was felt to be cause for anxiety. About 2000 tons of coal had been bought; but it had not arrived. Rochdale is another town which has had to purchase coal at increased prices. At Leeds some anxiety has been felt owing to the non-arrival of supplies; the stock of coal at one station running very short. This has been relieved; and an additional purchase has been made. Last Friday the Directors of the Derby Gas Company announced that, owing to the prolonged strike of the miners, and the consequently enhanced cost of coal, the price of gas would be advanced 3d. per 1000 cubic feet from the 9th inst. until further notice.

One natural effect of the serious curtailment of the supplies of coal has been an extraordinary demand for coke, with the necessary consequence that the price of this class of fuel, as already indicated, has been greatly advanced. This is felt in some districts to be a particular hardship upon the very poor, who use coke for house-fire purposes, and in two or three towns, where gas-works are owned by the Municipality, efforts have been made to get the price reduced to something like the old level irrespective of the abnormal demand. At the meeting of the Manchester City Council last Wednesday, the Chairman of the Gas Committee was invited to arrange for the sale of coke to small consumers at a limited price. The suggestion was admittedly made on philanthropic grounds; but the reply was that it would be well-nigh impossible to discriminate between one customer and another, and that the scheme was impracticable. At Salford, on the same day, a similar suggestion was made; and here too the answer was much to the same effect. Mr. Holland, the Chairman of the Gas Committee

went, however, into some particulars of the additional expense to which the Gas Department had been put owing to the miners strike. Although the Committee made favourable contracts in July for the coal and cannel required, they had had no deliveries since the strike began, and had been compelled to buy 2586 tons of coal and 1361 tons of cannel in the open market. The coal cost 8s. 4½d. per ton, and the cannel 5s. 2d. per ton, over the contract prices; and this meant that the Committee had had to pay £1334 as their share of the cost of the dispute. The extra price charged for coke had recouped part of this extra expenditure; but the net loss which would fall on the department was £923. If the strike continued, that loss would be increased. People living in the neighbourhood of the gas-works had come to look upon them as their special preserve for cheap fuel; but they were no more entitled to exceptional privileges than those who lived farther away. At Bolton the matter was introduced in the form of a question as to the cause of the advantages alleged to be given to consumers outside the borough over those within it; and a plea was set up for special consideration of the case of poor people. This was met by a suggestion that those who employed labour were entitled to as much consideration as the labourers. Alderman Miles, the Chairman of the Gas Committee, declined to be led into these controversial paths; and he pointed out that the people outside the town who had coke at low prices had made contracts with the Corporation before the present difficulty arose.

THE DROUGHT AND PROVINCIAL WATER SUPPLIES.

The heavy showers of rain which have fallen during the past fortnight have not been general throughout the country; so that, while some towns have had the pleasure of seeing their stock of water slowly rising, others have witnessed a continued diminution. In the case of Bradford, there has been a material increase in the amount of water in store; and at the beginning of last week, the high-level reservoir contained sufficient for four weeks' requirements, and the low-level ones for fourteen weeks. On the other hand, the Barnsley Corporation have found it necessary to apply to the millowners on the Ingbirchworth dyke and the River Don to make a concession of one-half of their compensation water; and this they have consented to do, on terms to be settled. Regarding the supply of Dublin, a long statement was made by Mr. J. E. Walker, the Chairman of the Water Committee, at the meeting of the Municipal Council yesterday week. He quoted a number of figures, which showed that, before the reduced storeage compelled the Committee to take steps in the matter, the out-townships were consuming a very excessive quantity of water. The normal capacity of the Roundwood reservoir, he said, was about 15 million gallons per day for the townships and city. They succeeded in reducing the consumption to 8 millions per day; but, in consequence of the rain, the public ran up the amount to 9 millions. He was sorry to say that his report that day showed there had been a further increase to 10 million gallons. With a daily consumption of 8 millions, they had sufficient water at Roundwood to supply the citizens for 35 days at least; but, if the consumption continued to increase, of course the quantity would be diminished, and they might perhaps not have 30 days' supply. He also stated that the Committee were quite alive to the future condition of the storeage at Roundwood, and had given instructions to the City Engineer to make surveys with the view of augmenting it. The rainfall has had a satisfactory effect on the amount of water in store in the Leeds Corporation reservoirs. On Friday there were 31 days' supply in hand; and with the amount which can be obtained by pumping, 41 days' supply. The Leicester Corporation Water Committee determined last week to turn off the supply to the consumers from 8 p.m. to 5.30 a.m.; and they will continue to do so until there is some improvement in the amount of water in store, which, on Wednesday last, had fallen to 40 days' supply. The quantity of water in the possession of the Newcastle and Gateshead Gas and Water Company is still diminishing; and last Tuesday it was down to 469 million gallons. A meeting of the millowners on the Loxley and the Don was held last Tuesday to consider (1) the stoppage by the Sheffield Corporation of the compensation water from Dam Flask, the dam being reported empty; and (2) a request for some concession in the supply of compensation water, having regard to the unprecedented drought. The cessation of the Dam Flask supply was reported to be productive of great inconvenience to the millowners, especially those on the Loxley; but in consideration of the drought, the meeting decided to take no action in the matter. With regard to the question of some concession in compensation water, the matter was left over for future consideration. The full supply of water is to be resumed throughout the whole of the district of the Stockport Water Company from to-morrow. The amount of water in the reservoirs has considerably improved, although it is still very far below the usual quantity at this time of the year.

The Want of Light in Public Conveyances.—"The great companies that carry the travelling public, whether in omnibuses or in railway carriages, display a very inadequate sense of their duty," says the *Lancet*, "in the matter of providing light. Last year the General Omnibus Company introduced the electric light into the centre of the omnibus, instead of the oil-lamp at the door; and at first it seemed as if the passengers would be able to beguile the time by reading newspapers or books. But the light has become small by degrees, and is altogether inadequate for any such pleasant purpose. On the railway lines, with but few exceptions, the same semi-darkness reigns. We protest strongly against the persistence in this state of things, as one altogether out of date. Men and women spend too much of their time now in travelling for this to be tolerated. Our protest is in the interest of the public and of the eyes of our patients. But the interest of the railways and the omnibus companies would also surely be served by the reform; and we strongly advise the public to patronize the company that is most generous in the matter of providing efficient light."

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

At a meeting of the Glasgow Town Council on Thursday, the Gas and Electric Lighting Committee reported upon the contracts for stores which have been entered into for the year. Mr. Breeze wanted to know particulars about the contracts, which were not set forth in the minutes; but he was told by Mr. Ure, the Convener of the Committee, that details were omitted to save space. This was surely a lame excuse, because the space required for two or three hundred articles should not exceed a page or two; and the information might be given in a private document to members of the Corporation. On being questioned as to the prices which are being paid for coal, Mr. Ure declined to give them, because, he said, they never were made public. That is certainly right, as rival coalowners would take advantage of such information, and the Corporation might be deprived, on account of intrigue, of some of their best purveyors of coal. It was, perhaps, from a suspicion that the information was wanted for some purpose not altogether in the public interest, that Mr. Ure was so brusque with Mr. Breeze. Still there could be no harm in giving, not the rates agreed upon with the different contractors, but the average prices paid for the different varieties of coal, which would be a means of guiding other corporations. It is well known that the Glasgow Corporation are astute purchasers in the coal market. Others emulate them, but come a long way after; and I have not the slightest doubt that they would be grateful for the slightest particle of information they might get as to the doings of the Glasgow Committee. I think, too, such information could be given without prejudice to the Glasgow Corporation; but, of course, it is the right of Glasgow, as of other corporations, to manage their own business in their own way, so long as the community are satisfied.

It is reported that there are now 11,169 gas-stoves belonging to the Corporation of Glasgow on hire throughout the city. At May 31 last, the number was 10,781; so that nearly 400 have been given out during the past summer. The number of stoves and heating appliances sold increased during August by 110, and now amounts to 14,751. This is one of the effects of cheap gas.

The Corporation of Glasgow have in force a system of awards, by premium, to the Managers of their respective works, the amount of which is determined upon the basis of the output of gas. This year the amounts of the premiums have been fixed at £170 each to the Managers of the Dalmarnock and Dawsholm works, and £150 to the Manager of the Tradeston works; and these sums were voted by the Town Council on Thursday.

In July of next year, the Corporation take over the tramway system in the city; and they are making arrangements for the working of the service themselves. One of their proposals is to light the cars by means of electricity; and the Tramway Committee are at present negotiating with the Gas and Electric Lighting Committee, with a view to getting the batteries which will be employed on the cars charged from the Corporation electric lighting works. Mr. Arnot, the Electrical Engineer, has been instructed to prepare a statement showing the cost of laying mains to the five car depôts which it is proposed to establish, and of superintending the plant. It is found that the demand for electric lighting is so great that the mains which have been laid are unable to carry the energy. Accordingly, it has been resolved to lay down three additional feeder mains, at a cost of £3000. This means further capital outlay, with but little return for it. At the Council meeting on Thursday, Mr. Arnot's salary, on account of the amount and the responsibility of his work, was advanced from £250 to £350 a year.

The Police Commission of North Berwick, who have recently taken over the undertaking of the local Gas Company, this week reduced the price of gas from 6s. 8d. to 5s. per 1000 cubic feet; and they hold forth the hope of another reduction—probably of a shilling—at the close of the current year. This has been effected by a saving of £400 upon the price of coal, as compared with last year, and by the low amount which has to be paid for interest and contribution to the sinking fund. Even with the reduction proposed, it is estimated there will be a surplus at the end of the year of over £300. The Corporation seem to have made a good bargain acquiring the gas supply.

At the meeting of the Aberdeen Town Council on Monday, the recommendation of the Gas Committee to expend £300 upon oil-gas plant, as an experiment, came up, whereupon there arose a babel of tongues which was not in the least edifying. The Committee's recommendation was that "a few retorts suitable for the oil process" should be erected. When it was submitted, Mr. Young moved the rejection of the recommendation, on the ground that an experiment such as was proposed would give them no more information than they already possessed, and that to spend £300 upon experiments would be simply throwing money away. He would have no objection, if the plant were made a permanent one. It was evident that Mr. Young spoke of the Peebles process; and in that he was under a misapprehension. But his seconder, Mr. Sinclair, who also seemed to think it was the Peebles process which was recommended, found a motive—which I think was quite an unwarranted thing for him to do—in that the deputation (who visited Peebles) were bound to recommend something. Treasurer Bisset then made an extraordinary speech in support of the Committee. He said they had information on the subject, in testimonials to which many high-sounding names were attached, and which declared that the process (evidently again the Peebles) was an unqualified success. When they looked at the matter closely, however, they would find that these testimonials were not quite so valuable as appeared on the surface. It was reported to the deputation that no purification of the gas was needed; but when it was tested, in the presence of the patentee, that gentleman himself had to admit that it was in a condition in which it ought not to have been used. The Gas Committee were not, therefore, prepared to accept any report or testimonial in reference to the matter, without testing the process (again evidently the Peebles process) for themselves. As to the assertion that the plant proposed was for temporary purposes, he might say that the Gas Manager (Mr. Smith) was perfectly satisfied that he could work for the process

a machine that was formerly used for the production of water gas. He considered it would be very foolish to prevent the carrying out of the experiment proposed. Well, in this I agree with Mr. Bisset, that it would be very foolish to prevent the carrying out of experiments. But I part company with him when he decries the reports and testimonials in favour of the Peebles process which they had before them. Some of these reports were prepared after exhaustive trials—such, for instance, as those by Mr. Mitchell, of Edinburgh, and Mr. Linton, of Leith. Mr. Yuill, of Alloa, too, has given valuable testimony in favour of it. He is now engaged working the process, with which he is quite satisfied. Others—such as Mr. Scott, of Galashiels—are similarly situated. These gentlemen all speak from facts; and is it to be assumed that the Aberdeen deputation are able, on theoretical grounds, to discard all their testimony? With regard to the purity of the gas, I do not know who reported to the deputation that it needed no purification. The patentee himself does not say so; and, in fact, he sends the oil gas through the purifiers, along with the coal gas. It was not, therefore, possible to test the oil gas for purity by itself, unless by means of an experimental apparatus, which might not be reliable; and any such test should not be sufficient to condemn the oil gas made by the Peebles process. If it should require purification—as it in reality does—that again should not be sufficient to condemn it, because any gas which may be made in Aberdeen from oil will also require to be purified. The question for the Aberdeen Corporation is simply one of cost; and if Mr. Smith, or anyone else, is able to make and purify oil gas or water gas cheaper than is done by the Peebles process, it is quite open to them to do it—provided they are satisfied that they do not infringe any existing patent. It is there where the rub comes in. Is it possible to make either description of gas except by one or other of the patented methods? or is Mr. Smith prepared to hold that some,or all, of the existing patents are invalid? The latter raises a serious question, and one which I will not attempt to discuss, not having an interest in upholding any particular patent. To resume the narrative, another speaker opposed the Committee because "they were now having the electric light put in; and, besides, the people were pretty well pleased with the gas as it was." Another speaker, supporting the Committee, thought it a wise thing to use oil, because "they could prevent a syndicate of coalowners making an extortionate charge." Then Mr. Farquhar, in defending the Committee, said "the deputation went over the ground pretty rapidly; but they saw certain fallacies which they would have been caused to believe by reports." "They had not been able to ascertain the exact price of oil gas, and they wanted to prove it for themselves." There is no harm in the Aberdeen Corporation "proving for themselves" what the cost of oil gas will be; but it is to be regretted that some members of the Council should have thrown doubt upon the veracity, or the capability of gentlemen who stand high in the profession for both uprightness and ability. Further, had the experiments been to find out the cost of working, there would be reason in them; but apparently what is contemplated is to try to discover a better process than exists at present. It may be supposed in Aberdeen that such a process can be found; but the Corporation ought to have had very strong grounds for believing so before they voted even £300 to try to find it. Yet that is what they have done; for, by 22 votes to 3, they adopted the Committee's recommendation. I should say that a better policy would have been to have waited for a year, to see how others who have taken up any of the existing processes will succeed, and then to have made up their minds whether they could do anything in the way of "preventing" coal syndicates.

The Proposed Acquisition of the Gomersal Water-Works by the Local Board.—At the meeting of the Gomersal Local Board on Monday last week, a letter was read from the Water Company declining to accept less than £10,000 for their undertaking, but stating that they were willing to submit the matter to arbitration, if the Board would be bound by the award and pay all costs. The question was referred to a Committee.

Gas Illuminations in York.—Notwithstanding the prospect of a short supply of coal, the York Gas Company were able to meet the unusual demands made upon them for the illumination of the city last Thursday evening, on the occasion of the visit of the Duke and Duchess of York. Some very effective devices were put up by the Company at the Mansion House, the Yorkshire Insurance Office, and their own offices.

A New Water Scheme for Redruth.—On behalf of the Local Government Board, Colonel R. M. Ducat, R.E., held an inquiry at Redruth last Tuesday week with reference to an application by the Local Board for power to borrow £9500 for the purpose of providing a fresh water supply for the town. It is proposed to obtain the water from Penstruthal, from whence it will flow by gravitation (supplemented by pumping when necessary) to a reservoir, capable of holding about 4 million gallons, which is to be constructed at Sandy Lane. There was a strong opposition to the scheme; it being pointed out that some of the owners of the streams objected to the water being taken, and, moreover, if the Penstruthal mines were re-started, the supply would be cut off. At the conclusion of the inquiry, Colonel Ducat visited the proposed source of supply.

Serious Leakage at the New Cant Clough Reservoir of the Burnley Corporation.—At the last meeting of the Burnley Town Council, one of the members inquired if the Water Committee had discovered anything with respect to the leakage at the new reservoir at Cant Clough, which had been constructed at a cost of about £160,000. In reply, Mr. Thornber said it had been known for a considerable time that a borehole at Worsthorne had been affected by the rise and fall of water in the Cant Clough reservoir; and the Committee decided that, as soon as an opportune time arrived, they would make a searching examination at a point which was considered the likeliest for a leakage, if any existed. They had got down to the tunnel which conducted the water away from the reservoir, and had found some little leakage in the rocks. The Water Manager (Mr. Williamson), however, doubted if this would be the full extent of the leakage

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct. 7.*

Sulphate of Ammonia.—The market, after dropping to £13, seems to have come to a stop; and a slightly steadier feeling is perceptible. In any case, the panic is over; and no doubt these lower prices are attracting more orders. In view of the comparatively small supplies, and the corresponding October requirements, a hardening tendency is not improbable. The still low quotations of the dealers are generally found to be devoid of any sound basis when sifted; and the attempts at further depression have only for their object the buying at the lowest possible point. Makers are adapting themselves gradually to the new order of things; but there is no pressure to sell, and it is not easy to secure spot parcels. Nitrate is a little easier.

LONDON, *Oct. 7.*

Tar Products.—In consequence of the coal strike, pitch is selling at a somewhat better price for prompt delivery—27s. having been paid for London "spot." It is thought that pitch will not recede much in value during the present year; but, when the coal market resumes its normal condition, it is feared a considerable reduction in pitch will have to be made to enable fuel makers to compete. The other tar products are exceedingly quiet; and, although there is more inquiry for benzols, their value does not improve. Tar acids are weak; but there are no important stocks. Production, however, appears to be up to demand; and therefore there is little hope of better values coming to pass this autumn. Prices are nominally as follows: Tar, 12s. 6d. to 14s. Pitch, 25s. to 27s. Benzols, 50's, 1s. 6d.; 90's, 1s. 5d. Creosote salts, 20s. Creosote, 1¾d. Solvent naphtha, 1s. 2d. Toluol, 1s. 6d. Crude benzol naphtha, 30 per cent., 7½d. Carbolic acid, 60's, 1s. 4d.; crystals, 5¾d. Cresol, 1s. 2½d. Anthracene, 30 per cent., "A," 1s. 1d.; "B," 9d.

Sulphate of Ammonia appears to be recovering from the fall which accentuated itself last week. Very little new business has been done, although sales are reported at £12 12s. 6d. to £13, less 3½ per cent. Gas liquor is quoted at 8s. to 9s.

COAL TRADE REPORTS.

From Our Own Correspondents.

North-Eastern Coal Trade.—There is a much stronger request for coal in the North-east—pressing demands coming in from the Midlands at a time when the end of the shipping season to the Baltic is approaching; so that there is not only full work for all the collieries, but there is also that additional demand, which is being met at higher prices to some extent. There is, however, some difficulty in satisfying the requirements, owing to the carrying power being restricted. Still, very large extra quantities of coal are being sent into the Midlands, both of steam and best gas qualities. Best Northumbrian steam coals are very firm; and some extraordinary high prices have been paid to ensure rapid delivery—as much as 17s. per ton f.o.b. in one instance. From that price down to about 15s. per ton have been the rates during the last few days; the exact amount being chiefly determined by the period of delivery. Second-class steam coals are in demand, one or two orders for fuel for locomotive coals having been booked by some of the collieries producing this kind of fuel. Small steam coals are in request for manufacturing, at from 5s. to 6s. per ton, according to quality. For gas coals, there has been a very strong demand; and the prices have advanced during the week. Much gas coal is still being delivered at 6s. per ton; but the pressure of the demand of late has been such that the prices for quantities that were not contracted for, have varied from 9s. to 11s. per ton f.o.b.—one large producer, who is fully sold, asking 12s. per ton for the period he can next deliver at. Manufacturing coals are very steady, the demand from some of the Yorkshire and Lancashire mills taking up all the available supply. Coke is steady, the production being less. Gas coke is unaltered; but the local gas companies are trying more actively to promote its use for household purposes. In this district, the idea seems to prevail that the long strike of the coal miners in the Midlands is now approaching its end; and that a very short time will see the men at work, and the demand returning to something nearer its normal volume.

Lancashire Coal Trade.—The difficulty of obtaining supplies of all sorts of fuel in no way decreases, the partial resumption of work at the few collieries in Lancashire having had no appreciable effect in bringing coal upon the market; and prices have continued to steadily move upwards. The supplies coming into this district are chiefly being obtained from Durham, Staffordshire, and Scotland; but they come very irregularly to hand, owing to the extreme delay in deliveries. To secure coal for immediate requirements, exceptional prices have therefore to be paid. The commonest descriptions of engine fuel have not been obtainable under about 18s. per ton; ordinary steam coal has ranged from 20s. to 23s.; and screened coal, from 25s. up to 30s. per ton, delivered at stations in this district. Even at these high figures, only small quantities are procurable, which barely keep works going from hand to mouth; and there has been a steadily increasing number of establishments which have either had to be partially stopped, or go on short time. The position of some of the gas-works is also becoming serious—such stocks as they held being in many cases already exhausted; and it is only with limited supplies, bought at very high figures, that they are able to keep going. Amongst others, the Manchester Corporation have now been compelled to come into the market to purchase coal; and cannel slack, which has recently been sold for engine purposes, has, owing to the scarcity of other descriptions of fuel, been offered to them at a pretty high figure.

Scotch Coal Trade.—There is little to be said of the coal trade in Scotland. The large demand continues; and prices are, if anything, harder than they were a week ago. The men are working steadily; but, as before, sales are nearly all for immediate delivery, and coal-owners are hampered by the large amount of contracts entered into at low prices before the trouble with the men began. As soon as the strike in England ends, the present demand will fall off; and then

current prices will be very much those of the contracts. The prices quoted are: Main, 9s. to 9s. 3d.; ell, 9s. 6d. to 10s.; splint, 9s. 6d. to 9s. 9d.; and steam, 10s. 6d. per ton, f.o.b. Glasgow. The shipments for the week amounted to 219,628 tons—a decrease as compared with the preceding six days of 7890 tons, but an increase over the corresponding week of last year of 50,754 tons. For the year to date, the total exports have been 5,521,517 tons—a decrease as compared with the same period of last year of 191,171 tons.

Water-Works for Blandford.—The Directors of the Blandford New Water-Works Company have accepted a tender for the construction of the necessary works for supplying the town with water, amounting to £6197.

Gainsborough Water Supply.—The Gainsborough Local Board yesterday week decided to ask the Local Government Board to sanction a further loan of £2000, in addition to £12,500 recently applied for, for the purpose of extending the water-works.

Prepayment Meter Charges at Macclesfield.—On the recommendation of the Gas Engineer (Mr. J. G. Newbigging), the Macclesfield Gas Committee have fixed the charges for gas by prepayment meter at 1d. for 20 cubic feet when fittings are wholly provided by the Corporation, 1d. for 22½ cubic feet when the fittings are only partly provided, and 1d. for 25 cubic feet when meters only and no fittings are provided.

Completion of the Transfer of the Runcorn Water-Works.—The necessary steps for the completion of the purchase of the Runcorn, Weston, and Halton Water-Works were taken on the 23rd ult. The Runcorn Commissioners held on that day a special meeting, and affixed their seal to the deed of conveyance, and also to mortgages for the necessary loans. Cheques were drawn for £67,000, the amount of the purchase-money, and the incidental expenses—in all, a total of £68,897. The Chairman of the Water Committee congratulated the town on the favourable terms on which they had become possessed of the undertaking.

Wrexham and the Electric Light.—The Wrexham Electric Supply Company are anxious to dispose of their Provisional Order, and have offered it to the Corporation for £500. The members of that body have recently had a special meeting to consider the subject. In the course of the discussion, it transpired that the Order will lapse if it is not acted upon within twelve months, and that the estimated cost of a scheme for the town is £14,000. Several members, among whom was the Mayor (Alderman R. W. Evans), considered that it would be unwise to purchase the Order; but in the end they resolved, by nine votes to five, to tender the Company £250 for it.

West Gloucestershire Water Company.—The half-yearly meeting of this Company was held last Saturday week, when it was reported that during the six months ending Sept. 2, 582 additional services had been laid; making the number of houses and other properties supplied 4510, which together with some meter and other miscellaneous supplies, were estimated to produce a water-rental of £3565 per annum. After meeting all expenses in the half year, there was a balance in hand sufficient to pay a dividend at the rate of 1 per cent. per annum, and leave £212 to be carried forward. The adoption of the report was moved by the Chairman (Mr. Enoch Horton), who stated that the Company were making solid progress; and it was a great pleasure to him to be in a position to propose the declaration of their first dividend. During the half year they had spent above £1000 in making extensions; and since June they had commenced laying mains in other important districts. The report was adopted.

Bexhill Gas and Water Company.—The half-yearly meeting of this Company was held last Friday week. The report which was submitted stated that there was a net profit for the half year of £796, as compared with £751 in the corresponding period of 1892. The Directors were pleased to be able to inform the shareholders that, notwithstanding the great drought experienced during the summer, the supply of water had been considerably more than sufficient for all requirements. With regard to their progress, there had been a satisfactory increase of new services both for water and gas in the six months. Although occurring since June 30 last, the Directors also desired to mention that arrangements were being made with the Corporation of Hastings for the supply, on favourable terms by the Company, of water to meet their need. This the Company were able to do from the surplus water at their new works; and it was a matter of great satisfaction to the Board that, in addition to considerably increasing the Company's income, the supply at Buckholt was of such an ample nature as to admit of the arrangement without impairing the supply to Bexhill. The report was adopted, with a dividend at the rate of 4 per cent. per annum on the original capital of £24,000.

The New Taff Vawr Water-Works for Cardiff.—The members of the Cardiff Corporation last week paid their annual visit to the borough water-works, under the guidance of their Water Engineer (Mr. J. A. B. Williams). The greatest interest was naturally manifested in the new (No. 2) reservoir which has been completed in connection with the Taff Vawr project, and which has a capacity of 327 million gallons. The company were entertained to luncheon by the Mayor (Mr. W. E. Vaughan) at the side of this reservoir, after which Alderman Jones gave some particulars regarding the work of the Water Committee. He said that No. 1 reservoir was now in course of construction; and they expected to expend upon it between £150,000 and £160,000. The capacity would be about the same as No. 2 reservoir; but it was originally intended that it should only be capable of storing 160 million gallons. In addition to this, they would have to obtain borrowing powers for the lower, or No. 3, reservoir; but, although it might not be wanted for many years to come, one application to Parliament would be less costly than two. In responding to the toast of his health, Mr. Williams said the Council had works in hand which would cost considerable sums of money; but they had the happy reflection that the water revenue was increasing at the rate of £2000 to £2500 a year. They could well afford to construct an additional reservoir every five years. Assuming the new one would cost £200,000 at 3½ per cent., this would represent £6500, or about three years' growth of revenue.

Amalgamated Water-Gas Company, Limited.—A Company has been registered under this title, with a capital of £250,000, in £1 shares, to take over as a going concern and amalgamate the undertakings of the British Water-Gas Syndicate, Limited, the Yorkshire and Lancashire Water-Gas Company, Limited, and the North British Water-Gas Syndicate, Limited, and all or any of the assets and liabilities of these Companies; to promote the use of water gas for illuminating, heating, motive power, and other purposes; and to carry on the business of engineers, iron and brass founders, metal workers, boiler and tube makers, machinists, iron and steel converters, smelters, mine owners, colliery owners, coal and coke merchants, and manufacturing chemists. The first Directors are to be appointed as follows: One by the Directors of the British Water-Gas Syndicate, Limited, one by the Directors of the North British Water-Gas Syndicate, Limited; and one by the Directors of the Yorkshire and Lancashire Water-Gas Company, Limited. The registered office is at Commercial Buildings, Park Row, Leeds.

Launceston Water Supply.—At a recent monthly meeting of the Launceston Town Council, the question of obtaining sanction for carrying out the new scheme of water supply was under consideration. The Mayor (Mr. J. Kittow) proposed that the various reports presented by the Water Committee on the subject should be confirmed, and that the Bray Down scheme, as recommended, should be adopted. Dr. Andrews, who seconded the motion, remarked that while several things might be urged in favour of the Kingsbear scheme, innumerable persons would have to be dealt with in regard to compensation for interfering with water rights. Mr. Treleaven proposed, as an amendment, that no further steps be taken until the reports and correspondence in reference to both schemes had been discussed and decided upon. He pointed out that the Kingsbear scheme had been sanctioned by the ratepayers at a public meeting. Mr. White seconded the amendment, and remarked that no distinct understanding had been come to with the owners of property at Bray Down. In the result, the motion was carried by 14 votes to 2—the latter being the mover and seconder of the amendment. The scheme, which has been several times under consideration, is now in a fair way to be carried out.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 668.)

Issue.	Share	When ex-Dividend.	Dividend & Div. Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	13 Apl.	10½	Alliance & Dublin 10 p. c.	10	17½—18½	..	5 13 6
100,000	10	,,	7½	Do. 7 p. c	10	12—13	..	5 15 4
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	102—104	..	4 16 2
100,000	20	31 May	8	Bahia, Limited	20	10½—11½	..	13 18 3
200,000	5	12 May	6½	Bombay, Limited	5	5½—6	..	5 8 4
40,000	5	,,	6½	Do. New	4	3¾—4¼	..	5 13 0
380,000	Stck.	16 Aug.	11½	Brentford Consolidated	100	218—223	..	5 3 1
180,000	,,	,,	8½	Do. New	100	164—169	..	5 0 7
220,000	20	15 Sept	11½	Brighton & Hove Original	20	41—43	..	5 6 11
888,500	Stck.	31 Aug.	5	Bristol	100	102—105	..	4 15 3
320,000	20	29 Sept.	11½	British	20	42—44*	..	5 4 7
50,000	10	31 Aug.	11½	Bromley, Ordinary 10 p. c.	10	19—20	..	5 15 0
51,510	10	,,	8½	Do. 7 p. c.	10	15—16	..	5 6 3
328,750	10	28 July	2	Buenos Ayres (New) Limited	10	5½—6½	..	3 1 6
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	97—100	..	5 0 0
150,000	20	13 July	8	Cagliari, Limited	20	26—28	+1	5 14 3
550,000	Stck.	28 Apl.	12½	Commercial, Old Stock	100	250—255	+1	4 18 0
165,000	,,	,,	9½	Do. New do.	100	189—194	..	4 17 11
160,762	,,	15 June	4½	Do. 4½ p. c. Deb. do.	100	125—130	..	3 9 3
800,000	Stck.	15 June	13	Continental Union, Limited	100	230—235	..	5 10 7
200,000	,,	,,	10	Do. 7 p. c. Pref	100	191—196	..	5 2 0
75,000	Stck.	15 Sept.	10	Crystal Palace District	100	185—190	..	5 5 3
486,090	10	28 July	10	European, Limited	10	21—22	..	4 10 11
354,060	10	,,	10	Do. Partly paid	7½	15—16	..	4 13 9
5,646,590	Stck.	16 Aug.	12	Gaslight & Coke, A, Ordinary	100	225—230	—8	5 4 4
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	95—100	..	4 0 0
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	262—267	..	3 14 10
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	175—180	..	4 3 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	172—177	..	3 19 1
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	261—266	+1	3 15 1
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	155—160	..	3 15 0
1,061,150	,,	15 June	4	Do. 4 p. c. Deb. Stk.	100	126—129	..	3 2 0
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	128—132	..	3 8 2
908,000	,,	,,	6	Do. 6 p. c. do	100	172—177	..	3 7 9
3,800,000	Stck.	12 May	12	Imperial Continental	100	230—235	—1	5 2 1
75,000	5	15 June	6	Malta & Mediterranean, Ltd.	5	5½—5¾	..	5 4 4
560,000	100	2 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	100	103-105*	+1½	4 15 3
541,920	20	15 June	5	Monte Video, Limited	20	12¾—13¾	..	7 8 2
150,000	5	31 May	10	Oriental, Limited	5	7½—8	..	6 5 0
60,000	5	29 Sept.	7	Ottoman, Limited	5	4—4¼*	..	7 15 6
166,870	10	—	2	Pará Limited	10	1½—2	—½	—
420,000	100	2 May	6	People's Gas of Chicago— 1st Mtg. Bds.	100	100—105	..	5 14 3
500,000	100	1 June	6	2nd Do.	100	98—102	..	5 17 8
150,000	10	28 Apl.	5	San Paulo, Limited	10	8—9	..	5 11 1
500,000	Stck.	31 Aug.	15½	South Metropolitan, A Stock	100	304—309	..	5 0 4
1,350,000	,,	,,	12	Do. B do.	100	248—253	..	4 14 10
260,000	,,	,,	13	Do. C do.	100	259—264	..	4 18 5
750,000	,,	13 July	5	Do. 5 p. c. Deb. Stk.	100	148—152	..	3 5 9
60,000	Stck.	31 Aug.	11½	Tottenham & Edm'nton, "A"	100	210—215	..	5 7 0
				WATER COMPANIES.				
744,897	Stck.	29 June	10	Chelsea, Ordinary	100	267—272	..	3 13 7
1,720,252	Stck.	29 Mar.	8	East London, Ordinary	100	218—222	..	3 12 1
544,440	,,	29 June	4½	Do. 4½ p. c. Deb. Stk.	100	140—143	..	3 2 11
700,000	50	15 June	8½	Grand Junction	50	111—115	..	3 13 11
708,000	Stck.	16 Aug.	11	Kent	100	285—290	..	3 15 10
1,043,800	100	29 June	9½	Lambeth, 10 p. c. max.	100	214—219	+1	3 16 3
406,200	100	,,	7½	Do. 7½ p. c. max.	100	199—204	..	3 13 0
310,000	Stck.	29 Sept.	4	Do. 4 p. c. Deb. Stk.	100	128-131*	..	3 1 0
500,000	100	16 Aug.	12½	New River, New Shares	100	333—338	..	3 11 9
1,000,000	Stck.	28 July	4	Do. 4 p. c. Deb. Stk	100	132—135	..	2 19 3
902,300	Stck.	15 June	6	S'thwk & V'xhall, 10 p. c. max.	100	153—158	..	3 15 11
126,500	100	,,	6	Do. D 7½ p. c. do.	100	142—147	..	4 1 7
1,155,066	Stck.	15 June	10	West Middlesex	100	262—267	..	3 14 10

*Ex Div

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO., HYDRAULIC AND GAS ENGINEERS, BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

TELEPHONE No. 2698.

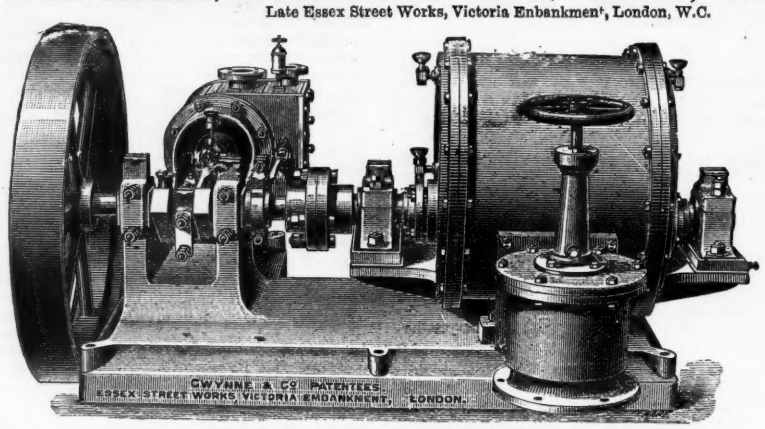
Late Essex Street Works, Victoria Enbankment, London, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 189, Gresham House, Old Broad Street, LONDON, E.C.

VOLCANIC Fire Cement (Winkelmann's)
Fire Resistance 4500° Fahr.
ANDREW STEPHENSON, Sole Agent, 189, Gresham House, Old Broad Street, LONDON, E.C.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, SCOTLAND, or NEWTON GRANGE, NEAR DALKEITH.

SADLER AND CO., LIMITED,
MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

LIQUOR, Tar, and Spent Oxide wanted.
BROTHERTON AND CO., Ammonia and Tar Distillers, BIRMINGHAM, LEEDS, and WAKEFIELD.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works sundries. (See last week, p. 616).
Telegrams: "HUTCHINSON BROS., BARNSLEY."

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

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ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

WANTED, by a young married Man, a Situation as WORKING MANAGER of Gas-Works. Has held his present management four years (steam engine and exhauster employed).
Apply, by letter, to No. 2290, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield; AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. II., centre of JOURNAL.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

TO INVENTORS AND OTHERS.

PATENTS for Inventions Secured and TRADE MARKS REGISTERED throughout the World. Advice on all matters connected with the above. Handbook gratis on application.
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PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors, for the erection of Gas-Works for Towns, Villages Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."

GOLD MEDAL, 1892.

TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

WANTED, immediately, a Gas Stoker, used to Shovel Charging. Wages, from 28s. to 30s. per week. A constant job to a good Man.
Apply to the MANAGER, Gas-Works, Briton Ferry, SOUTH WALES.

WANTED, for a Gas-Works 12 miles from London, a Young Man as BLACKSMITH and MAINLAYER. Wages, 30s. per week.
Apply by letter, stating reference, to No. 2291, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a good Stoker. Must be a steady, trustworthy Man, used to Shovel Charging Constant place. A young Man from a small country works will be preferred. Wages, 25s. per week.
Apply to the MANAGER, Gas-Works, Romsey, HANTS.

GAS AND ELECTRIC FITTING.

WANTED, a thoroughly practical Man as FOREMAN. Capable of estimating and superintending the carrying out of both Electric and Gas Work. Age not to exceed 35. Wages, 60s. a week.
Address MANAGER, Gas-Fittings Company, Limited, 126, Duke Street, LIVERPOOL.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

OXIDE OF IRON.

FINEST Quality of Natural Bog Ore.
Particulars and price, apply to Mr. T. L. ARCHER, 20, Fennel Street, MANCHESTER.

MESSRS. DEBENHAM, TEWSON, FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, CHEAPSIDE, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

FOREMAN Fitter and Mainlayer Wanted. Wages, 35s. per week.
Applications, endorsed "Foreman Fitter" on outside, stating age, with copies of not more than three recent testimonials, to be addressed to the CHAIRMAN of the Gas Committee, Gas-Works, Longton, STAFFS., so as to be delivered not later than the 17th of October.

FOR SALE—100 9-feet lengths of 3-inch CAST-IRON GAS-PIPES, perfectly new.
Apply to O. SISSONS, Manager, Gas-Works, BROCKLESBY.

PURIFIERS.

FOR SALE—Three 6-feet square PURIFIERS, complete with lifting arrangement, 6-inch Valves, and Connections. Replaced by others of larger capacity.
Apply to F. TURNER, Manager, Gas-Works, CHARD.

SPECIAL BARGAIN.

FOR SALE—A perfectly new 30,000 feet per hour HORIZONTAL DOUBLE PUMP RECIPROCATING EXHAUSTER, with Steam-Engine, with Connections and Valves.
One Second-hand (thoroughly overhauled) VERTICAL PUMP EXHAUSTER, with Steam-Engine (with clean Water and Liquor Pumps attached), to pass 7000 cubic feet of Gas per hour.
The whole of the above plant can be inspected, and full particulars with prices will be sent, on application to No. 2241, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ABERDEEN CORPORATION GAS.

THE Town Council of Aberdeen are prepared to receive TENDERS for the construction of a THREE-LIFT GASHOLDER at their Gallowhills Works. Outer Lift to be 207 feet diameter by 40 feet deep.
Copy of Specification, Conditions of Contract, and Form of Tender may be obtained, and Drawings seen, at the Engineer's Office, Cotton Street, on payment of Two Guineas.
Sealed tenders, endorsed "Tender for Gasholder," and addressed to the Town Council of Aberdeen, to be lodged at the Gas Office, Aberdeen, not later than Two p.m., on Tuesday, the 24th inst.
The lowest or any tender may not be accepted.
W. GORDON,
Town Clerk.
Town House, Aberdeen
Oct. 4, 1893.

G. L. LAMBERT, 26, Alberta Terrace, Nottingham. Consultations, Advice, Reports on Various Branches of **Practical** Mechanical Engineering and Machinery. **Specialities** in Water, Sewage, and Gas Plant Making. **Surveyor** of Steam-Ships, Marine Engines, Boilers, and General Machinery. **Detailed Inspection** of Engineering Contracts during Manufacturing and Erection.

TO GAS AND WATER COMPANIES AND MANAGERS.

AN ASSOC.M.INST.C.E. having an extensive experience in GAS and WATER WORKS' DESIGN and ERECTION, now Chief Assistant in a large Gas-Works and Engineer to several small ones, having designed and erected a THREE HUNDRED and a ONE HUNDRED MILLION GAS-WORKS complete, besides several small ones, also ENLARGED many other Works, including NEW LIFTS to EXISTING GASHOLDERS, REGENERATIVE SETTINGS, &c., would be pleased to VISIT WORKS and ADVISE on their EXTENSION or ALTERATION, making SPECIFICATIONS, DRAWINGS, ESTIMATES, and superintend erection if desired.

SPECIALITIES.

Any EXTENSION or ALTERATION to GAS or WATER WORKS. ASSESSMENT of Gas-Works. New HOLDERS, TANKS, ROOFS, PURIFIERS, or FILTER-BEDS. TELESCOPING or adding FRESH LIFTS to EXISTING HOLDERS. REGENERATIVE SETTINGS, for SMALL GAS-WORKS, without Excavations. SAVING 20 PER CENT. in first cost, renewals, and working.

Address "Boz," 9, Gracechurch Street, LONDON, E.C.

THE Romford Gas and Coke Company, Limited, invite TENDERS, on or before the 14th inst., for the surplus TAR produced at their Works. Railway Waggons or Road Waggons can run up to the side of the Tank.

Particulars may be had from

W. D. CHILD,
Manager.

Gas-Works, Nursery Walk, Romford,
Oct. 7, 1893.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

SPENT OXIDE.

THE Gas Committee invite Tenders for the purchase of about 620 tons of SPENT OXIDE.

Further Particulars and Form of Tender may be obtained from the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Spent Oxide," to be sent to me not later than Five p.m., on Thursday, Oct. 19, 1893, addressed to the Chairman of the Gas Committee, Town Hall, Salford.

By order,
SAML. BROWN,
Town Clerk.

Town Hall, Salford,
Oct. 4, 1893.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

OXIDE OF IRON.

THE Gas Committee are prepared to receive TENDERS for the supply of 250 tons of OXIDE OF IRON for purifying the Gas at their orks.

Forms of Tender and further Particulars may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Oxide of Iron," to be sent to me not later than Five p.m. on Thursday, Oct. 19, 893, addressed to the Chairman of the Gas Committee, Town Hall, Salford.

By order,
SAML. BROWN,
Town Clerk.

Town Hall, Salford,
Oct. 4, 1893.

BRISTOL GAS COMPANY.

TENDERS FOR TAR.

THE Directors of this Company invite TENDERS for the purchase of the TAR to be produced at all or either of their three Stations, during a period of One year, commencing on the 1st day of January, 1894.

The annual quantities of Tar produced at each of the Stations at present are, approximately, as follows:—

Avon Street	650,000 gallons.
Canons' Marsh	550,000 "
Stapleton	650,000 "

Further Particulars, with Forms of Tender, may be obtained on application to the undersigned, to whom also tenders, sealed, and endorsed "Tender for Tar," must be delivered not later than Ten a.m., on Monday, the 13th day of November prox.

JOHN PHILLIPS,
Secretary.

Chief Offices: Canons' Marsh,
Bristol, Oct. 4, 1893.

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

NOTICE is hereby given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of the above Company will be held at the Offices of the Company, 30, Gracechurch Street, in the City of London, on Tuesday, the 31st day of October inst., at Three o'clock in the Afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th day of June last, to declare a Dividend, and to transact the General Business of the Company.

The Transfer Books will be closed from the 18th to the 31st inst., both inclusive.

By order of the Board,
SAMUEL WOOD,
Secretary.

Offices: 30, Gracechurch Street,
London, Oct. 3, 1893.

Price 2s. per dozen, or 10s. 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

Now Ready, Price 15s., Limp Cloth, the Thirteenth Yearly

ANALYSIS OF THE ACCOUNTS OF THE Metropolitan Water Companies,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the year ended December 31, 1892, or March 31, 1893, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the year ended December 31, 1892.

Compiled and arranged by
ALFRED LASS, F.C.A.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

NOW READY.
GAS AND WATER CO.'S DIRECTORY, 1893.
Seventeenth Annual Issue, 5s.
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Handsomely Bound in One Vol., Price 10s.
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OXIDE OF IRON.

JAMES HUNTER, LESSEE, MINER, AND SHIPPER OF NATURAL IRISH BOG ORE.

This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.

Samples and Prices on application.

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Established 1872.

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A FIRST-CLASS CANNEL COAL,

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FOR ANALYSIS, PRICE, AND ALL OTHER PARTICULARS, APPLY TO

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CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton	10,500 cubic feet.
Illuminating Power	16·4 candles.
Coke	68 per cent.

For prices, f.o.b. Ship or Delivered by Rail, apply to

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NEWCASTLE-ON-TYNE.
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Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.

Is cheap and easily fixed to any form of main.

Will be found the most efficient appliance of the kind yet introduced.

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PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT.)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.

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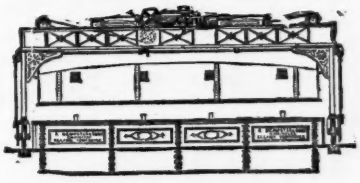

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THE SILICA FIRE-BRICK COMPANY,

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MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY

Strongly recommended where EXCESSIVE HEATS have to be maintained.

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FIRE-CLAY & BRICK WORKS,

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

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Shipments Promptly and Carefully Executed.

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Manufacture and keep in Stock at their Works

(also large stock in London)

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Note.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers and rendering leakage impossible.

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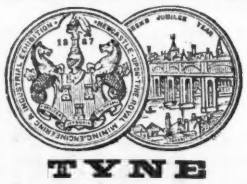

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BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	36·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cen't.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

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(Wrought out of Holmside and South Moor Collieries.)

PRESENT production 4000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves about 70 per cent. of excellent Coke. To show the progress of HOLMSIDE COALS, it may be mentioned that the quantity carbonized by the London Gas Companies in 1885 was about 200,000 tons; whereas the present consumption of HOLMSIDE COALS in London alone is at the rate of nearly

600,000 Tons per Annum.

Full particulars on application to

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FOR GAS, WATER, AND STEAM.

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BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.,

Output about 3000 tons per day.

Analysis—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Ipswich Gaslight Company, Devonport Gas Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY,

LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON,

Fitter.

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REGENERATIVE FURNACES.

Unsurpassed in Efficiency, Economy, Durability, and Easy Working.

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Highest Results in Gas, & Excellent Coke.

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THE LOTHIAN COAL COMPANY,

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NEWBATTLE COLLIERIES,

DALKEITH, N.B.

THORNLEY GAS COALS

Worked by the

WEARDALE IRON AND COAL COMPANY, Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

The Analysis made by Messrs. J. and H. T. Pattinson, Public Analysts for Northumberland, gives 10,500 cubic feet of Gas per ton, with an Illuminating Power of 16·3 Candles and 67·3 per cent. of Coke. The following is a Working Analysis made of these Coals by the Tudhoe and Sunderland Bridge Gas Company:—

[copy.]

Tudhoe and Sunderland Bridge Gas Company.

Tudhoe Gas-Works,
Spennymoor,
8th June, 1893.

Messrs. The

WEARDALE IRON & COAL COMPANY, LTD.

Gentlemen,

For the last two months we have used your **THORNLEY GAS COAL** exclusively at these gas-works; and I have pleasure in herewith giving you the actual results obtained during the trial.

Yield of Gas per ton: 10,300 cubic feet.

Yield of Coke: 13½ cwt.

Illuminating Power of Gas, average of a series of tests, **17 Sperm Candles.**

The Coke was of excellent quality.

The following is a complete ultimate Analysis of the Coal.

	Per Cent.
Carbon	83·128
Hydrogen	5·116
Oxygen	7·401
Nitrogen	0·585
Sulphur	0·620
Ash	3·130
Water	0·020
	100·000

Analysis of the Coke.

Carbon	93·31
Sulphur	0·61
Ash	5·00
Moisture	1·08
	100·00

I am, Gentlemen,
Yours truly,
A. B. Cowan,
Manager.

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

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By THOMAS NEWBIGGING, M.Inst.C.E.

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ESTABLISHED 1836.

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Prices and Analysis of all the Scotch Cannels on application.

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Gas Companies are solicited to try Samples of the
MIRFIELD
BLACK BED GAS COAL.
Prices and Analysis on application.
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RAVENSTHORPE, NEAR DEWSBURY.

LONDONDERRY GAS COALS
FROM THE
MARQUIS OF LONDONDERRY'S COLLIERIES,
COUNTY OF DURHAM.
Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.
FOR PRICES AND PARTICULARS, APPLY TO
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SEAHAM HARBOUR, COUNTY OF DURHAM.

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FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
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SPANNERS, RATCHET BRACES, LIFTING JACKS
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We have for sale Hydrate of Iron containing 77 per cent. of Ferric Oxide and 17 per cent. of Water. Directions given for mixing for Purifiers.
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Absolutely the Cheapest, Simplest, and most Economical Lamp before the Public.
Price of **Bracket Lamp, from 13s.**

Suitable for Suspension, or can be fixed to the ordinary Bracket in place of Burner.
Price of **Suspension Lamp, from 21s.**
Consumption 6 and 9½ cubic feet respectively.
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SOLE MANUFACTURERS OF WECK'S PATENT CENTRE-VALVE.
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"FORTRESS DONNINGTON, SALOP." "FORTRESS LONDON."—Telegraphic.

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ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

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GASHOLDERS, Telescope and Single Lift, any size. Some of the largest in the Kingdom, erected by this Firm, are giving the highest s tisfaction.

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PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

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REVOLVING GAS-RETORTS

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POSSESS THE FOLLOWING ADVANTAGES OVER ALL OTHERS:—

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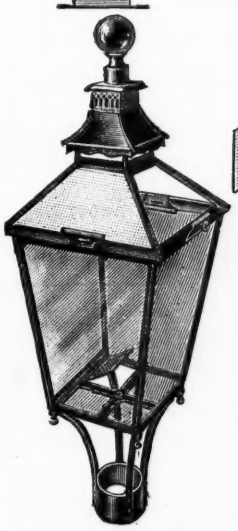

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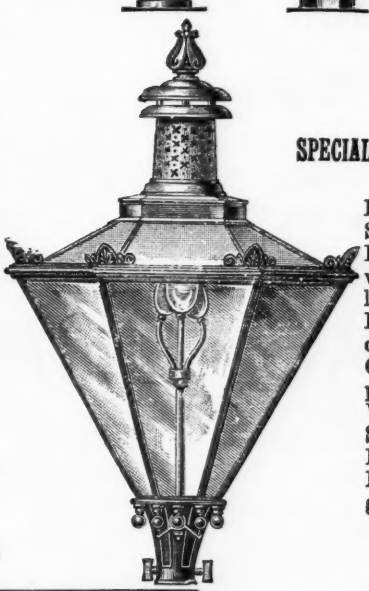

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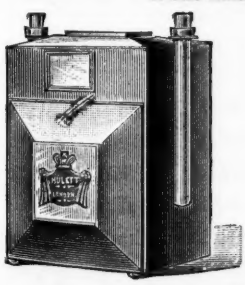

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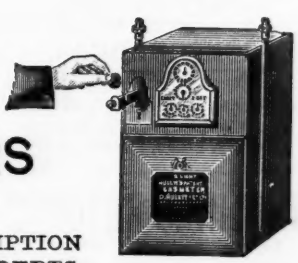

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IMPROVED
Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

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The Apparatus has been supplied to the following Firms—

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And to the following Gas Companies and Corporations—

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ST. ALBANS.	LEICESTER.	IPSWICH.
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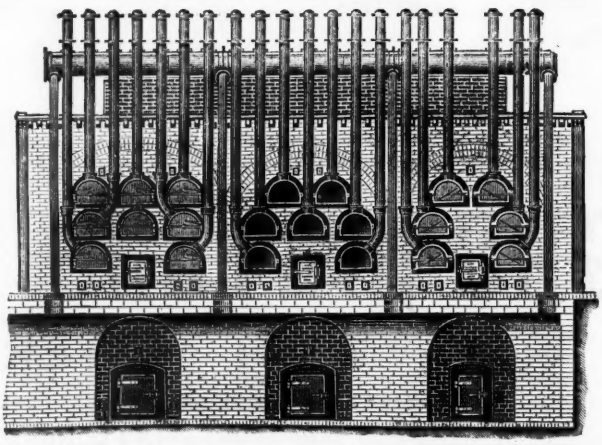

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REGENERATOR AND GENERATOR FURNACES ON DRAKE'S, FRITH'S, SIEMENS'S, KLONNE'S, HASSE'S VALON'S, SOMERVILLE'S, PONSARD'S and other Principles.

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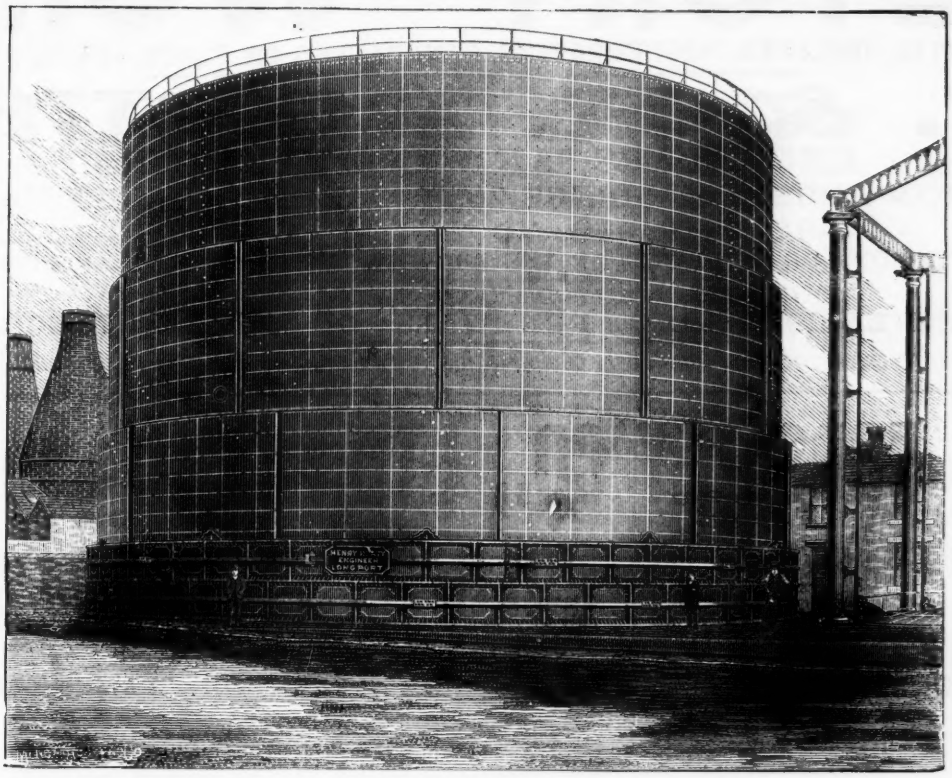

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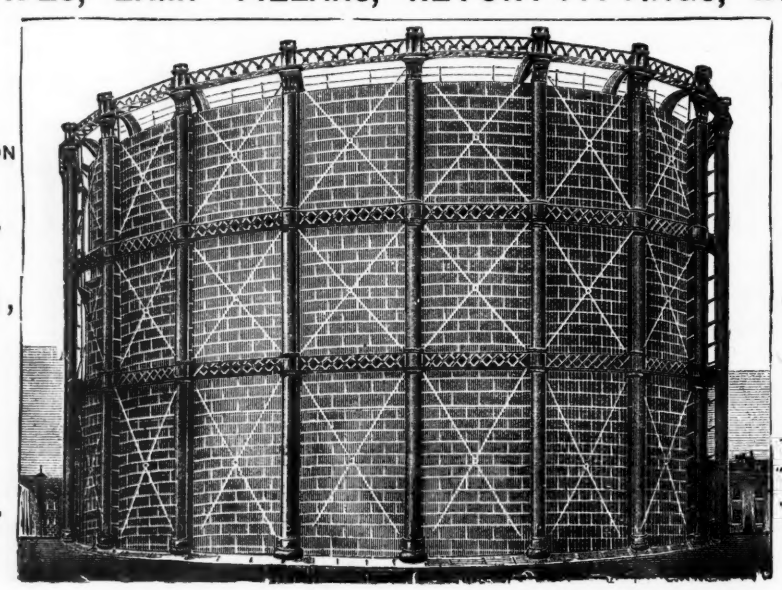

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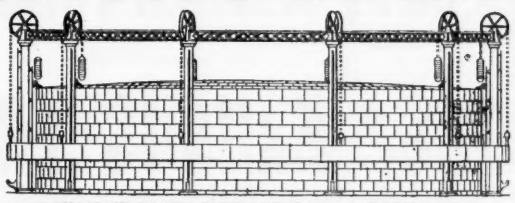

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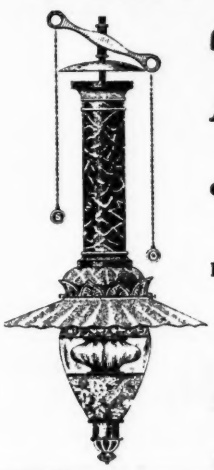

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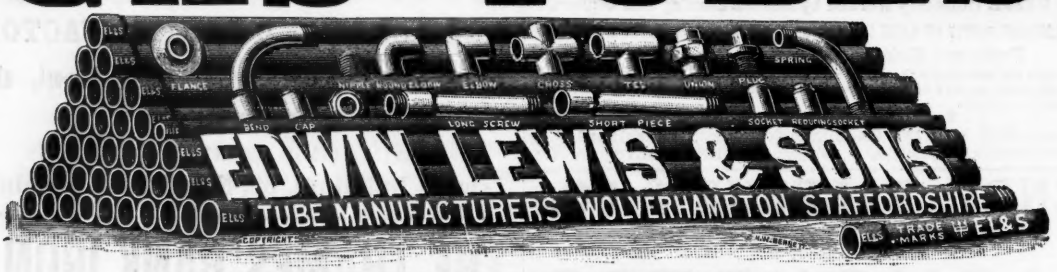

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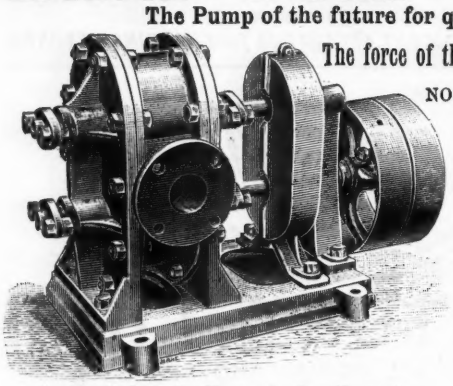

As supplied to the Harrogate Gas-Works for Pumping Gas Liquor.

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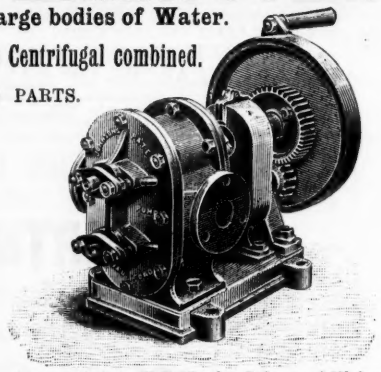

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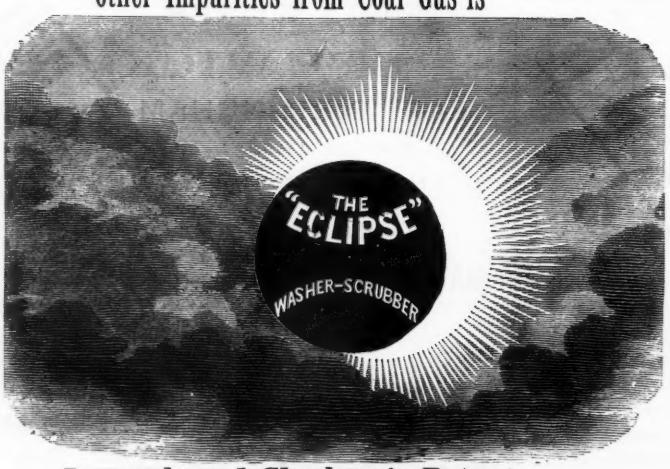

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The Patent Wooden Balls thoroughly break up the Gas; give an immense amount of freshly-wetted Surface; and do not clog or increase back pressure.

Whilst the Gas is passing through and amongst the Balls, it is continually showered upon by the contents of Buckets.

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